08

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

NOTICE TO BIDDERS

AND

SPECIAL PROVISIONS

FOR CONSTRUCTION ON STATE HIGHWAY IN SAN BERNARDINO COUNTY FROM 1.2 MILES NORTH OF NIPTON ROAD OVERCROSSING TO 0.5 MILE SOUTH OF YATES WELL ROAD OVERCROSSING

In District 08 On Route 15

Under

Bid book dated June 3, 2013	**Standard Specifications dated 2006**
Project Plans approved February 25, 2013	**Standard Plans dated 2006**

Identified by

Contract No. 08-368504

08-SBd-15-177.3/181.1

Project ID 0800000628

Federal-Aid Project
ACNHI-015-3(045)280E

Electronic Advertising Contract

Bids open Thursday, July 25, 2013 OSD
Dated June 3, 2013 IH

****

SPECIAL NOTICES

****

- For federal-aid projects, the Department is modifying its DBE program.
- See Section 2, "Bidding," of these special provisions regarding a mandatory prebid meeting.
- Refer to Section 8-1.07, "Liquidated Damages," of the Amendments to the Standard Specifications for your project-specific liquidated damages based on your total bid.
- The Department is providing an electronic Information Handout for this project. Refer to Section 2-1.03B, "Supplemental Project Information," in the Amendments to the Standard Specifications for the location of this information.
- The contract award period has been extended for this project.
- The Department is allowing contractors to submit electronic payroll records to the District Labor Compliance Office. Refer to section titled "Electronic Submission of Payroll Records" under Section 5, "General," of these special provisions.

CONTRACT NO. 08-368504

The special provisions contained herein have been prepared by or under the direction of the following Registered Persons.

HIGHWAYS

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Larry Sartori
No. 57611
Exp. 12/31/13
CIVIL
STATE OF CALIFORNIA

TRAFFIC

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Thanh Trinh
No. 41189
Exp. 3/31/2015
CIVIL
STATE OF CALIFORNIA

LANDSCAPE

LICENSED LANDSCAPE ARCHITECT

LICENSED LANDSCAPE ARCHITECT
Michael M Babich No. 2121
Signature
2/28/14
Expiration Date
12/10/12
STATE OF CALIFORNIA

ELECTRICAL

REGISTERED ELECTRICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Mohammed Eleiwat
No. 19650
Exp. 9/30/13
ELECTRICAL
STATE OF CALIFORNIA

CONTRACT NO. 08-368504

ARCHITECT

LICENSED ARCHITECTS

LICENSED ARCHITECT
Doug Lowe
No. C 15341
Exp. 06-30-13
STATE OF CALIFORNIA

STRUCTURES

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Shervin Pahlavan
No. 44463
Exp. 03-31-14
CIVIL
STATE OF CALIFORNIA

MECHANICAL

REGISTERED MECHANICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
C.Bylinski
No. M20878
Exp. 06-30-13
MECH.
STATE OF CALIFORNIA

MECHANICAL

REGISTERED MECHANICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Solomon Wong
No. M27626
Exp. 06-30-13
MECH.
STATE OF CALIFORNIA

CONTRACT NO. 08-368504

ELECTRICAL (STRUCTURES)

Jagpindar S. Sandhu

REGISTERED ELECTRICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
J. S. Sandhu
No. 11803
Exp. 09-30-14
ELECT.
STATE OF CALIFORNIA

ELECTRICAL (STRUCTURES)

Tommy F. Lee

REGISTERED ELECTRICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Tommy F. Lee
No. 18534
Exp. 12-31-14
ELECT.
STATE OF CALIFORNIA

WATER AND WASTEWATER

Jerome R. Marcotte

REGISTERED CIVIL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
Jerome R. Marcotte
No. C-36844
Exp. 06-30-14
CIVIL
STATE OF CALIFORNIA

TABLE OF CONTENTS

NOTICE TO BIDDERS 1
BID ITEM LIST 3
SPECIAL PROVISIONS 10
SECTION 1. (BLANK) 10
SECTION 2. BIDDING 10
2-1.01 MANDATORY PREBID MEETING 10
2-1.02 TIE BID RESOLUTION 10
2-1.03 DISADVANTAGED BUSINESS ENTERPRISES 10
2-1.04 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS 12
SECTION 3. CONTRACT AWARD AND EXECUTION 12
3-1.01 CONTRACT AWARD 12
3-1.02 SMALL BUSINESS PARTICIPATION REPORT 12
3-1.03 CALTRANS BIDDER - DBE INFORMATION FORM 12
SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES 12
SECTION 5. GENERAL 12
5-1.01 EMISSIONS REDUCTION 12
5-1.02 BUY AMERICA 12
5-1.03 SUBCONTRACTOR AND DISADVANTAGED BUSINESS ENTERPRISE RECORDS 12
5-1.04 PERFORMANCE OF DISADVANTAGED BUSINESS ENTERPRISES 13
5-1.05 PARTNERING DISPUTE RESOLUTION 13
5-1.06 PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS 14
5-1.07 SURFACE MINING AND RECLAMATION ACT 17
5-1.08 ELECTRONIC SUBMISSION OF PAYROLL RECORDS 17
5-1.09 FORCE ACCOUNT PAYMENT 18
5-1.10 AREAS FOR CONTRACTOR'S USE 19
5-1.11 PAYMENTS 19
5-1.12 SUPPLEMENTAL PROJECT INFORMATION 20
5-1.13 WATER CONSERVATION 20
5-1.14 SPECIES PROTECTION 21
5-1.15 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD 21
5-1.16 BORROW, DISPOSAL AND MATERIAL SITES 22
5-1.17 NONHIGHWAY FACILITIES (INCLUDING UTILITIES) 22
5-1.18 DAMAGE REPAIR 23
5-1.19 RELIEF FROM MAINTENANCE AND RESPONSIBILITY 23
SECTION 6. (BLANK) 23
SECTION 7. (BLANK) 23
SECTION 8. MATERIALS 23
SECTION 8-1. MISCELLANEOUS 23
8-1.01 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS 23
8-1.02 STATE-FURNISHED MATERIALS 29
8-1.03 SLAG AGGREGATE 29
SECTION 8-2. CONCRETE 31
8-2.01 FREEZING CONDITION REQUIREMENTS 31
8-2.02 RAPID STRENGTH CONCRETE FOR STRUCTURES 32
8-2.03 CONTRACTOR QUALITY CONTROL (CONCRETE PAVEMENT) 37
SECTION 8-3. WELDING 37
8-3.01 WELDING 37
WELDING QUALITY CONTROL 39
WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES 42
SECTION 9. DESCRIPTION OF BRIDGE WORK 43
SECTION 10. CONSTRUCTION DETAILS 43
SECTION 10-1. GENERAL 43
10-1.00 CONSTRUCTION PROJECT INFORMATION SIGNS 43
10-1.01 ORDER OF WORK 43
10-1.02 CONTRACTOR SUPPLIED BIOLOGIST 44

10-1.03 WATER POLLUTION CONTROL 46
10-1.04 CONSTRUCTION SITE MANAGEMENT 60
10-1.05 STREET SWEEPING 71
10-1.06 TEMPORARY SOIL BINDER 72
10-1.07 TEMPORARY COVER 74
10-1.08 TEMPORARY CONCRETE WASHOUTS 77
10-1.09 TEMPORARY CONSTRUCTION ENTRANCE 79
10-1.10 PROGRESS SCHEDULE (CRITICAL PATH METHOD) 81
10-1.11 TIME-RELATED OVERHEAD 86
10-1.12 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES 88
10-1.13 CONSTRUCTION AREA SIGNS 89
10-1.14 MAINTAINING TRAFFIC 90
10-1.15 CLOSURE REQUIREMENTS AND CONDITIONS 93
10-1.16 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE 94
10-1.17 TEMPORARY PAVEMENT DELINEATION 96
10-1.18 BARRICADE 98
10-1.19 PORTABLE CHANGEABLE MESSAGE SIGNS 98
10-1.20 CHANNELIZER 99
10-1.21 TEMPORARY CRASH CUSHION MODULE 99
10-1.22 REMOVE YELLOW TRAFFIC STRIPE (HAZARDOUS WASTE) 101
10-1.23 EXISTING HIGHWAY FACILITIES 103
REMOVE SIGN STRUCTURE 103
REMOVE PAVEMENT MARKER 103
REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING 103
RESIDUE CONTAINING LEAD FROM PAINT AND THERMOPLASTIC 104
REMOVE ROADSIDE SIGN 104
RESET ROADSIDE SIGN 104
COLD PLANE ASPHALT CONCRETE PAVEMENT 104
10-1.24 CLEARING AND GRUBBING 105
10-1.25 WATERING 106
10-1.26 EARTHWORK 106
10-1.27 DUFF 106
10-1.28 ROCK BLANKET 107
10-1.29 IRRIGATION CROSSOVERS 108
10-1.30 IRRIGATION SLEEVE 108
10-1.31 ROCK OUTCROPPINGS 108
10-1.32 PRECAST CONCRETE TRASH RECEPTACLE 109
10-1.33 TREE WELL GRATE 109
10-1.34 GRAVEL MULCH 109
10-1.35 AGGREGATE SUBBASE 110
10-1.36 AGGREGATE BASE 110
10-1.37 LEAN CONCRETE BASE 110
10-1.38 HOT MIX ASPHALT 111
10-1.39 RUMBLE STRIP 112
10-1.40 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - SLURRY METHOD 113
10-1.41 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - DRY LIME METHOD 115
10-1.42 LIQUID ANTISTRIP TREATMENT 118
10-1.43 HOT MIX ASPHALT (TYPE C) 120
10-1.44 HOT MIX ASPHALT (MISCELLANEOUS AREAS) 128
10-1.45 JOINTED PLAIN CONCRETE PAVEMENT 128
10-1.46 CONCRETE PAVEMENT CRACK TREATMENT 131
10-1.47 GRIND CONCRETE PAVEMENT (WEIGH IN MOTION) 134
10-1.48 DISPOSAL OF PORTLAND CEMENT CONCRETE (PCC) PAVEMENT GROOVING AND GRINDING RESIDUES 134
10-1.49 PILING 136
CAST-IN-DRILLED-HOLE CONCRETE PILES 136
10-1.50 CONCRETE STRUCTURES 137
FALSEWORK 137
MEASUREMENT AND PAYMENT 138

10-1.51 STRUCTURE APPROACH SLABS (TYPE N) 138
10-1.52 SEALING JOINTS 141
10-1.53 REINFORCEMENT 141
MEASUREMENT AND PAYMENT 141
10-1.54 SIGN STRUCTURES 141
10-1.55 ROADSIDE SIGNS 143
10-1.56 INSTALL SIGN OVERLAY 143
10-1.57 FURNISH SIGN 143
SHEET ALUMINUM 145
PROCESS COLOR AND FILM 145
SINGLE SHEET ALUMINUM SIGN 145
LAMINATED PANEL SIGN 146
FORMED PANEL SIGN 147
MEASUREMENT AND PAYMENT 147
10-1.58 REINFORCED CONCRETE PIPE 147
10-1.59 MISCELLANEOUS FACILITIES 148
10-1.60 GRATED LINE DRAIN 148
10-1.61 SLOPE PROTECTION 150
10-1.62 MISCELLANEOUS CONCRETE CONSTRUCTION 150
10-1.63 MISCELLANEOUS IRON AND STEEL 150
10-1.64 WATER WELL 150
DRILL PILOT HOLE 151
COMPLETION OF WATER WELL 152
10-1.65 FENCE (TYPE DESERT TORTOISE) (TYPE 1) 158
10-1.66 CHAIN LINK FENCE 159
10-1.67 MONUMENTS 159
10-1.68 MARKERS AND DELINEATORS 160
10-1.69 METAL BEAM GUARD RAILING 160
ALTERNATIVE IN-LINE TERMINAL SYSTEM 160
10-1.70 CONCRETE BARRIER 161
10-1.71 TRANSITION RAILING (TYPE WB) 161
10-1.72 CRASH CUSHION (TYPE CAT) 161
10-1.73 THERMOPLASTIC PAVEMENT MARKING 162
10-1.74 THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE) 162
10-1.75 PAINT PAVEMENT MARKING 163
10-1.76 PARKING BUMPER 163
10-1.77 PAVEMENT MARKERS 164
SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS 164
10-2.01 GENERAL 164
COST BREAK-DOWN 164
10-2.02 (BLANK) 166
10-2.03 (BLANK) 166
10-2.04 HIGHWAY PLANTING 167
ROADSIDE CLEARING 167
PESTICIDES 168
PLANTING 168
PLANT ESTABLISHMENT WORK 169
10-2.05 IRRIGATION SYSTEMS 169
VALVE BOXES 169
BALL VALVES 170
GATE VALVES 170
ELECTRIC AUTOMATIC IRRIGATION COMPONENTS 170
REMOTE CONTROL VALVE ACTUATOR SYSTEM 171
PLANT ESTABLISHMENT WORK 171
IRRIGATION CONTROLLER ENCLOSURE CABINET 172
IRRIGATION SYSTEMS FUNCTIONAL TEST 172
PIPE 173
SPRINKLERS 173
WYE STRAINERS 173

FILTER ASSEMBLY UNIT 173
FILTER ASSEMBLY UNIT ENCLOSURE 173
FILTER ASSEMBLY UNIT BLANKET 174
PRESSURE REDUCING VALVE 174
FINAL IRRIGATION SYSTEM CHECK 174
SECTION 10-3. ELECTRICAL SYSTEMS 174
10-3.01 DESCRIPTION 174
10-3.02 COST BREAK-DOWN 174
10-3.03 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION 175
10-3.04 CONDUIT 176
10-3.05 TRAFFIC PULL BOXES 176
10-3.06 PULL BOX 176
10-3.07 CONDUCTORS, CABLES, AND WIRING 178
10-3.08 LED LUMINAIRES 178
10-3.09 PHOTOELECTRIC CONTROLS 183
10-3.10 WEIGH STATION BYPASS SYSTEM 183
10-3.11 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT 191
10-3.12 DISPOSING OF ELECTRICAL EQUIPMENT 192
10-3.13 PAYMENT 192
SECTION 11. (BLANK) 192
SECTION 12. BUILDING WORK 192
SECTION 12-1. GENERAL REQUIREMENTS 192
12-1.01 SCOPE 192
12-1.02 ABBREVIATIONS 193
12-1.03 COOPERATION 193
12-1.04 SUBMITTALS 193
12-1.05 SCHEDULE OF VALUES 194
12-1.06 INSPECTION 195
12-1.07 UTILITY CONNECTION 195
12-1.08 SANITARY FACILITIES 195
12-1.09 MEASUREMENT AND PAYMENT 195
12-1.10 PROJECT RECORD DRAWINGS 195
12-1.11 FIELD ENGINEERING 196
SECTION 12-2. SITEWORK 197
12-2.01 EARTHWORK FOR BUILDING WORK 197
12-2.02 AGGREGATE BASE 201
12-2.03 FREE DRAINING GRANULAR MATERIAL 202
12-2.04 CAST-IN-DRILLED-HOLE CONCRETE PILES 203
12-2.05 WATER SUPPLY SYSTEM 204
12-2.06 SEPTIC SEWAGE DISPOSAL SYSTEM 213
12-2.07 COMMUNICATIONS TOWER 221
12-2.08 GUARD POSTS 233
12-2.09 ACCESSIBLE PARKING AND AUTHORIZATION SIGNS 234
12-2.10 SITE FURNISHINGS 235
SECTION 12-3. CONCRETE AND REINFORCEMENT 239
12-3.01 CAST-IN-PLACE CONCRETE 239
12-3.02 ARCHITECTURAL PRECAST CONCRETE 245
SECTION 12-4. MASONRY 247
12-4.01 CONCRETE MASONRY UNITS 247
SECTION 12-5. METALS 253
12-5.01 STRUCTURAL STEEL FOR BUILDINGS 253
12-5.02 METAL DECK 259
12-5.03 COLD FORMED METAL FRAMING 261
12-5.04 BUILDING MISCELLANEOUS METAL 264
12-5.05 STAIR NOSING 268
12-5.06 EXPANSION JOINT COVER ASSEMBLIES 269
SECTION 12-6. WOOD AND PLASTICS 270
12-6.01 FINISH CARPENTRY 270

12-6.02 CABINETS 272
SECTION 12-7. THERMAL AND MOISTURE PROTECTION 276
12-7.01 WATERPROOFING 276
12-7.02 WATER REPELLENT COATING 278
12-7.03 INSULATION (GENERAL) 279
12-7.04 BATT AND BLANKET INSULATION 280
12-7.05 RIGID WALL INSULATION 282
12-7.06 ROOF BOARD 283
12-7.07 RIGID ROOF INSULATION 285
12-7.08 METAL ROOFING, LOW SLOPE 287
12-7.09 METAL ROOFING, STEEP SLOPE 290
12-7.10 METAL SIDING 295
12-7.11 METAL PANEL COLUMN COVERS, FASCIA AND SOFFIT 299
12-7.12 SHEET METAL FLASHING 302
12-7.13 ROOF ACCESSORIES 306
12-7.14 UNIT SKYLIGHTS 310
12-7.15 JOINT SEALANT 311
12-7.16 SEALANTS AND CAULKING 312
SECTION 12-8. DOORS AND WINDOWS 314
12-8.01 STEEL DOORS AND FRAMES 314
12-8.02 ROLL-UP STEEL DOORS 320
12-8.03 ACCESS DOORS 325
12-8.04 RAPID ROLL-UP DOORS 325
12-8.05 ALUMINUM CURTAIN WALL SYSTEM 328
12-8.06 STOREFRONT ENTRANCES 332
12-8.07 TRANSLUCENT PANEL WINDOWS 337
12-8.08 WINDOWS 341
12-8.09 DOOR HARDWARE 343
12-8.10 GLAZING 357
SECTION 12-9. FINISHES 360
12-9.01 RUBBER TILE FLOORING 360
12-9.02 GYPSUM WALLBOARD 363
12-9.03 GLASS-MAT FACED GYPSUM BACKING BOARDS 365
12-9.04 CERAMIC TILE 366
12-9.05 DETECTABLE WARNING SURFACE 374
12-9.06 RESILIENT BASE 375
12-9.07 CARPETING 376
12-9.08 PAINTING 380
12-9.09 FIBERGLASS REINFORCED PLASTIC PANELS 386
12-9.10 SUSPENDED CEILINGS 387
12-9.11 SUSPENDED GYPSUM BOARD CEILINGS 389
12-9.12 LINEAR METAL PANEL CEILINGS 391
12-9.13 STONE VENEER 396
SECTION 12-10. SPECIALTIES 399
12-10.01 TACKBOARDS 399
12-10.02 MARKER BOARDS 399
12-10.03 METAL TOILET PARTITIONS 400
12-10.04 LOUVERS 401
12-10.05 FLAGPOLE 402
12-10.06 INFORMATION DISPLAY BOARDS 403
12-10.07 INFORMATION DISPLAY CASES 404
12-10.08 METAL SIGNS 406
12-10.09 SIGNS 406
12-10.10 WARDROBE LOCKERS AND BENCHES 407
12-10.11 CANOPY AND AWNINGS 408
12-10.12 FREE STANDING STEEL SHELVING 412
12-10.13 CANTILEVER STEEL SHELVING 412
12-10.14 TOILET AND SHOWER ACCESSORIES 413
12-10.15 TRUCK STATIC WEIGHING SYSTEM 415

SECTION 12-11. EQUIPMENT 416
12-11.01 PRESSURE WASHER 416
12-11.02 DISPOSER 417
12-11.03 BUILT-IN MICROWAVE OVEN AND RANGE HOOD 418
12-11.04 COMPRESSED AIR SYSTEM 418
12-11.05 EXHAUST EVACUATION HOSE REEL AND FAN 421
12-11.06 INSPECTION PIT COVER 422
12-11.07 REVERSE OSMOSIS FILTRATION SYSTEM AND WATER SOFTENER 424
12-11.08 CLARIFIER TANK 428
12-11.09 WORKBENCH 430
SECTION 12-12. FURNISHINGS 430
12-12.01 HORIZONTAL BLINDS 430
12-12.02 AUDIO-VISUAL VENETIAN BLINDS 431
SECTION 12-13. SPECIAL CONSTRUCTION 432
12-13.01 FIBERGLASS REINFORCED PLASTIC BUILDINGS 432
12-13.02 PRE-ENGINEERED CONCRETE BUILDING 434
SECTION 12-14. (BLANK) 436
SECTION 12-15. MECHANICAL 436
12-15.01 MECHANICAL WORK 436
12-15.02 PIPE, FITTINGS AND VALVES 439
12-15.03 MECHANICAL INSULATION 451
12-15.04 AUTOMATIC FIRE SPRINKLER SYSTEMS, FIRE PUMPS, AND PRIVATE FIRE MAINS 454
12-15.05 PLUMBING FIXTURES 459
12-15.06 LIQUEFIED PETROLEUM GAS (LPG) SYSTEM 464
12-15.07 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS 466
SECTION 12-16. ELECTRICAL 475
12-16.01 ELECTRICAL WORK 475
12-16.02 BASIC MATERIALS AND METHODS 477
12-16.03 INDOOR-OUTDOOR FIBER OPTIC CABLES 486
12-16.04 SERVICE AND DISTRIBUTION 488
12-16.05 SYSTEM STUDIES AND FIELD TESTING 491
12-16.06 ELECTRICAL EQUIPMENT 493
12-16.07 LIGHTING 499
12-16.08 STANDBY GENERATOR 501
12-16.09 FIRE ALARM AND DETECTION SYSTEM 506
12-16.10 INTRUSION ALARM SYSTEM 509
12-16.11 BUILDING WATER CONTROL SYSTEMS 514
12-16.12 DOMESTIC WATER SYSTEM CONTROL PANEL 517
12-16.13 CLARIFIER CONTROL PANEL 520
12-16.14 TRUCK WEIGH-IN-MOTION SYSTEM 522
12-16.15 VEHICLE MONITORING AND SIGNAL SYSTEM 530
12-16.16 PROGRAMMABLE LOGIC CONTROLLER 534
12-16.17 VARIABLE MESSAGE SIGN 535
12-16.18 PUBLIC ADDRESS SYSTEM 538
12-16.19 CLOSED CIRCUIT TELEVISION SYSTEM (CCTV) 539
12-16.20 TRUCK STATIC WEIGHING ELECTRICAL SYSTEM 543
12-16.21 LIGHT EMITTING DIODE SIGNAL MODULE 545
12-16.22 HIGH MAST LIGHTING ASSEMBLY 551
12-16.23 SIGN LIGHTING FIXTURES-FLUORESCENT 556
AMENDMENTS TO THE STANDARD SPECIFICATIONS 559

STANDARD PLANS LIST

The Standard Plan sheets applicable to this contract include, but are not limited to those indicated below. Applicable Revised Standard Plans (RSPs) and New Standard Plans (NSPs) indicated below are included in the project plans as Standard Plan sheets.

A10A	Acronyms and Abbreviations (Sheet 1 of 2)
A10B	Acronyms and Abbreviations (Sheet 2 of 2)
A10C	Symbols (Sheet 1 of 2)
A10D	Symbols (Sheet 2 of 2)
A20A	Pavement Markers and Traffic Lines, Typical Details
A20B	Pavement Markers and Traffic Lines, Typical Details
A20C	Pavement Markers and Traffic Lines, Typical Details
A20D	Pavement Markers and Traffic Lines, Typical Details
RSP A24A	Pavement Markings – Arrows
RSP A24C	Pavement Markings – Symbols and Numerals
A24D	Pavement Markings – Words
RSP A24E	Pavement Markings – Words, Limit and Yield Lines
A40B	Shoulder Rumble Strip Details – Ground-In Indentations
A62B	Limits of Payment for Excavation and Backfill – Bridge Surcharge and Wall
A62C	Limits of Payment for Excavation and Backfill – Bridge
A62D	Excavation and Backfill – Concrete Pipe Culverts
RSP A62DA	Excavation and Backfill – Concrete Pipe Culverts
A73A	Object Markers
A73B	Markers
A73C	Delineators, Channelizers and Barricades
RSP A77A1	Metal Beam Guard Railing – Standard Railing Section (Wood Post with Wood Block)
A77B1	Metal Beam Guard Railing – Standard Hardware
A77C1	Metal Beam Guard Railing – Wood Post and Wood Block Details
RSP A77F1	Metal Beam Guard Railing – Typical Layouts for Structure Approach
RSP A77F4	Metal Beam Guard Railing – Typical Layouts for Structure Departure
RSP A77J4	Metal Beam Guard Railing – Transition Railing (Type WB)
A77L2	Metal Beam Railing – Terminal System (Type SKT)
A77L3	Metal Beam Railing – Terminal System (Type ET)
A77L4	Metal Beam Railing – Terminal System (Type CAT)
A82A1	Crash Cushion (Type CAT)
RSP A85	Chain Link Fence
A86	Barbed Wire and Wire Mesh Fences
RSP A87A	Curbs and Driveways
A87B	Asphalt Concrete Dikes
RSP A88A	Curb Ramp Details
A88B	Curb Ramp and Island Passageway Details
D73	Drainage Inlets
RSP D74B	Drainage Inlets
D87D	Overside Drains
D94B	Concrete Flared End Sections
D98C	Grated Line Drain Details
RSP H1	Planting and Irrigation – Abbreviations
RSP H2	Planting and Irrigation – Symbols
H3	Planting and Irrigation Details
H4	Planting and Irrigation Details
RSP H5	Planting and Irrigation Details
H6	Planting and Irrigation Details
RSP H7	Planting and Irrigation Details
H9	Planting and Irrigation Details

H10	Irrigation Controller Enclosure Cabinet
RSP T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
RSP T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
RSP T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
NSP T3A	Temporary Railing (Type K)
RSP T7	Construction Project Funding Identification Signs
T10	Traffic Control System for Lane Closure On Freeways and Expressways
T10A	Traffic Control System for Lane and Complete Closures on Freeways and Expressways
T53	Temporary Water Pollution Control Details (Temporary Cover)
T58	Temporary Water Pollution Control Details (Temporary Construction Entrance)
T59	Temporary Water Pollution Control Details (Temporary Concrete Washout Facility)
B0-1	Bridge Details
B2-3	16" and 24" Cast-In-Drilled-Hole Concrete Pile
RSP B6-21	Joint Seals (Maximum Movement Rating = 2")
B11-55	Concrete Barrier Type 732
RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs – Wood Post, Typical Installation Details No. 2
RS3	Roadside Signs – Laminated Wood Box Post Typical Installation Details No. 3
RS4	Roadside Signs, Typical Installation Details No. 4
S1	Overhead Signs – Truss, Instructions and Examples
S2	Overhead Signs – Truss, Single Post Type – Post Type II thru IX
S3	Overhead Signs – Truss, Single Post Type – Base Plate and Anchorage Details
S4	Overhead Signs – Truss, Single Post Type – Structural Frame Members Details No. 1
S5	Overhead Signs – Truss, Single Post Type – Structural Frame Members Details No. 2
S6	Overhead Signs – Truss, Gusset Plate Details
S8	Overhead Signs – Truss, Single Post Type – Round Pedestal Pile Foundation
S9	Overhead Signs – Truss, Two Post Type – Post Types I-S thru VII-S
S10	Overhead Signs – Truss, Two Post Type – Base Plate and Anchorage Details
S11	Overhead Signs – Truss, Two Post Type – Structural Frame Members
S12	Overhead Signs – Truss, Structural Frame Details
S13	Overhead Signs – Truss, Frame Juncture Details
S15	Overhead Signs – Truss, Two Post Type – Round Pedestal Foundation
S16	Overhead Signs – Walkway Details No. 1
S17	Overhead Signs – Walkway Details No. 2
S17A	Overhead Signs – Walkway Details No. 3
S20	Overhead Signs – Steel Frames – Removable Sign Panel Frames
S21	Overhead Signs – Removable Sign Panel Frames Mounting Details
S22	Overhead Signs – Truss, Removable Sign Panel Frames – 110" and 120" Sign Panels
S35	Overhead Signs – Tubular, Single and Two Post Type – Base Plate and Anchorage Details
S48	Overhead Signs – Lightweight Post Details
S49	Overhead Signs – Lightweight Foundation Details
S82	Roadside Laminated Sign – Single or Multiple Panel, Type B (1" Thick)
S83	Roadside Laminated Sign – Single or Multiple Panel, Type B (2-1/2" Thick)
S85	Seam Closure, "H" Section Extrusion and Post Spacing Tables, Multi-Horizontal Laminated Panel Aluminum Signs
S86	Laminated Panel Details – Extrusions for Type A, B and H Panels
S89	Roadside Sign – Formed Single Sheet Aluminum Panel
S90	Channel and Bolt Hole Location, Overhead Formed Sign Panel
S91	Overhead Sign – Formed Sign Panel, Type A-3 Mounting Hardware
S92	Overhead Formed Sign Panel
S93	Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape
S94	Roadside Framed Single Sheet Aluminum Signs, Rectangular Shape
S95	Roadside Single Sheet Aluminum Signs, Diamond Shape
RSP ES-1A	Electrical Systems (Symbols and Abbreviations)
RSP ES-1B	Electrical Systems (Symbols and Abbreviations)
RSP ES-1C	Electrical Systems (Symbols and Abbreviations)

ES-2A	Electrical Systems (Service Equipment)
RSP ES-2C	Electrical Systems (Service Equipment Notes, Type III Series)
RSP ES-2D	Electrical Systems (Service Equipment and Typical Wiring Diagram, Type III – A Series)
RSP ES-2F	Electrical Systems (Service Equipment and Typical Wiring Diagram Type III – C Series)
ES-3B	Electrical Systems (Controller Cabinet Details)
RSP ES-4C	Electrical Systems (Signal Heads and Mountings)
RSP ES-4D	Electrical Systems (Signal Heads and Mountings)
RSP ES-5A	Electrical Systems (Detectors)
ES-5B	Electrical Systems (Detectors)
ES-5D	Electrical Systems (Detectors)
RSP ES-6E	Electrical Systems (Lighting Standard, Types 30 and 31)
ES-6F	Electrical Systems (Lighting Standard, Types 30 and 31, Slip Base Plate Details)
ES-6J	Electrical Systems (Lighting Standard – 80' to 160', High Mast Light Pole Foundation Details)
RSP ES-7E	Electrical Systems (Signal and Lighting Standard - Case 3 Arm Loading, Wind Velocity - 100 mph, Arm Lengths 15' to 45')
RSP ES-7F	Electrical Systems (Signal and Lighting Standard - Case 4 Arm Loading, Wind Velocity - 100 mph, Arm Lengths 25' to 45')
ES-7J	Electrical Systems (Signal and Lighting Standard – Advance Flashing Beacons)
NSP ES-8A	Electrical Systems (Pull Box)
NSP ES-8B	Electrical Systems (Traffic Rated Pull Box)
NSP ES-10A	Electrical Systems (Isofootcandle Diagrams)
NSP ES-10B	Electrical Systems (Isofootcandle Diagrams)
ES-13A	Electrical Systems (Splicing Details)
ES-15A	Electrical Systems (Sign Illumination Equipment)
ES-15C	Electrical Systems (Sign Illumination Equipment)
RSP ES-15D	Electrical Systems (Lighting and Sign Illumination Control)

CANCELED STANDARD PLANS LIST

The Standard Plan sheets listed below are canceled and not applicable to this contract.

NSP P31	Canceled on June 5, 2009
D97B	Canceled on June 6, 2008
NSP H54	Canceled on July 31, 2009
ES-8	Canceled on January 20, 2012
ES-10	Canceled on July 20, 2012

NOTICE TO BIDDERS

Bids open Thursday, July 25, 2013

Dated June 3, 2013

General work description: CONSTRUCT COMMERCIAL VEHICLE ENFORCEMENT FACILITY (CVEF)

The Department will receive sealed bids for CONSTRUCTION ON STATE HIGHWAY IN SAN BERNARDINO COUNTY FROM 1.2 MILES NORTH OF NIPTON ROAD OVERCROSSING TO 0.5 MILE SOUTH OF YATES WELL ROAD OVERCROSSING.

District-County-Route-Post Mile: 08-SBd-15-177.3/181.1

Contract No. 08-368504

The Contractor must have either a Class A license or Class B license or a combination of Class C licenses which constitutes a majority of the work.

The DBE Contract goal is 5 percent.

Federal-aid project no.:
ACNHI-015-3(045)280E

Bids must be on a unit price basis.

Complete the work, including plant establishment work, within 590 working days.

The estimated cost of the project is $34,000,000.

A mandatory prebid meeting is scheduled for this project at 10:00 a.m., on July 10, 2013, at Barstow Harvey House, 681 North First Avenue, Barstow, CA 92311.

The Department will receive bids until 2:00 p.m. on the bid open date at 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692. Bids received after this time will not be accepted.

The Department will open and publicly read the bids at the above location immediately after the specified closing time.

District office addresses are provided in the Standard Specifications.

Present bidders' inquiries to the Department and view the Department's responses at:

http://www.dot.ca.gov/hq/esc/oe/project_status/bid_inq.html

Questions about alleged patent ambiguity of the plans, specifications, or estimate must be asked before bid opening. After bid opening, such questions will not be treated as bid protests.

Submit your bid with bidder's security equal to at least 10 percent of the bid.

Prevailing wages are required on this Contract. The Director of the California Department of Industrial Relations determines the general prevailing wage rates. Obtain the wage rates at the DIR Web site, http://www.dir.ca.gov, or from the Department's Labor Compliance Office of the district in which the work is located.

The federal minimum wage rates for this Contract as determined by the United States Secretary of Labor are available at http://www.dot.ca.gov/hq/esc/oe/federal-wages.

If the minimum wage rates as determined by the United States Secretary of Labor differs from the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, the Contractor and subcontractors must not pay less than the higher wage rate. The Department does not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes helper, or other classifications based on hours of experience, or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by the Contractor and subcontractors, the Contractor and subcontractors must not pay less than the Federal minimum wage rate that most closely approximates the duties of the employees in question.

The Department has made available Notices of Suspension and Proposed Debarment from the Federal Highway Administration. For a copy of the notices go to http://www.dot.ca.gov/hq/esc/oe/contractor_info. Additional information is listed in the Excluded Parties List System at https://www.epls.gov.

DEPARTMENT OF TRANSPORTATION

LLS

BID ITEM LIST

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	070030	LEAD COMPLIANCE PLAN	LS	LUMP SUM
2	074016	CONSTRUCTION SITE MANAGEMENT	LS	LUMP SUM
3	080050	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
4	090100	TIME-RELATED OVERHEAD (WDAY)	WDAY	340
5	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
6	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
7	120120	TYPE III BARRICADE	EA	25
8	120159	TEMPORARY TRAFFIC STRIPE (PAINT)	LF	3,670
9	120165	CHANNELIZER (SURFACE MOUNTED)	EA	180
10	120300	TEMPORARY PAVEMENT MARKER	EA	150
11	128651	PORTABLE CHANGEABLE MESSAGE SIGN (EA)	EA	2
12	129000	TEMPORARY RAILING (TYPE K)	LF	6,240
13	129100	TEMPORARY CRASH CUSHION MODULE	EA	28
14	130300	PREPARE STORM WATER POLLUTION PREVENTIONPLAN	LS	LUMP SUM
15	130330	STORM WATER ANNUAL REPORT	EA	1
16	130560	TEMPORARY SOIL BINDER	SQYD	635,000
17	130570	TEMPORARY COVER	SQYD	2,000
18	130710	TEMPORARY CONSTRUCTION ENTRANCE	EA	4
19	130730	STREET SWEEPING	LS	LUMP SUM
20	130900	TEMPORARY CONCRETE WASHOUT	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21	141103	REMOVE YELLOW THERMOPLASTIC TRAFFIC STRIPE (HAZARDOUS WASTE)	LF	940
22	146002	CONTRACTOR-SUPPLIED BIOLOGIST (LS)	LS	LUMP SUM
23	150605	REMOVE FENCE	LF	17,200
24	150714	REMOVE THERMOPLASTIC TRAFFIC STRIPE	LF	24,600
25	150722	REMOVE PAVEMENT MARKER	EA	630
26	150742	REMOVE ROADSIDE SIGN	EA	6
27	150757	REMOVE SIGN STRUCTURE (EA)	EA	1
28	152317	RESET ROADSIDE SIGN (TWO POST)	EA	1
29	153103	COLD PLANE ASPHALT CONCRETE PAVEMENT	SQYD	24,700
30	160102	CLEARING AND GRUBBING (LS)	LS	LUMP SUM
31	170101	DEVELOP WATER SUPPLY	LS	LUMP SUM
32	190101	ROADWAY EXCAVATION	CY	470,000
33 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	CY	369
34 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	CY	245
35	200001	HIGHWAY PLANTING	LS	LUMP SUM
36	025382	GRAVEL MULCH (1"-BURGUNDY)	CY	1,400
37	025383	GRAVEL MULCH (3/4"-GOLD)	CY	300
38	025384	GRAVEL MULCH (2" TO 4"-BURGUNDY)	CY	210
39	025385	GRAVEL MULCH (2" TO 4"-GOLD)	CY	350
40	025386	GRAVEL MULCH (4" TO 10"-BURGUNDY)	CY	60

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	025387	GRAVEL MULCH (6" TO 12"-GOLD)	CY	21
42	200114	ROCK BLANKET	SQYD	980
43	025388	ROCK OUTCROPPING (3'-BURGUNDY)	EA	130
44	025389	ROCK OUTCROPPING (6'-BURGUNDY)	EA	16
45	025390	ROCK OUTCROPPING (6'-GOLD)	EA	12
46	025391	ROCK OUTCROPPING (4'-BURGUNDY)	EA	32
47	025392	ROCK OUTCROPPING (4'-GOLD)	EA	24
48	025393	ROCK OUTCROPPING (3'-GOLD)	EA	96
49	025394	TREE WELL GRATE	EA	26
50	204099	PLANT ESTABLISHMENT WORK	LS	LUMP SUM
51	208000	IRRIGATION SYSTEM	LS	LUMP SUM
52	208310	IRRIGATION SLEEVE	LF	1,420
53	208768	12" BITUMINOUS COATED CORRUGATED STEEL PIPE CONDUIT (.064" THICK)	LF	750
54	210130	DUFF	SQYD	143,800
55	250201	CLASS 2 AGGREGATE SUBBASE	CY	1,270
56	260203	CLASS 2 AGGREGATE BASE (CY)	CY	20,300
57	280000	LEAN CONCRETE BASE	CY	1,550
58	390129	HOT MIX ASPHALT (TYPE C)	TON	63,600
59	390132	HOT MIX ASPHALT (TYPE A)	TON	1,180
60	394050	RUMBLE STRIP	STA	56

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61	394060	DATA CORE	LS	LUMP SUM
62	394073	PLACE HOT MIX ASPHALT DIKE (TYPE A)	LF	2,680
63	394076	PLACE HOT MIX ASPHALT DIKE (TYPE E)	LF	15,400
64	394077	PLACE HOT MIX ASPHALT DIKE (TYPE F)	LF	120
65	394090	PLACE HOT MIX ASPHALT (MISCELLANEOUS AREA)	SQYD	292
66	397005	TACK COAT	TON	160
67	401050	JOINTED PLAIN CONCRETE PAVEMENT	CY	3,160
68	404092	SEAL PAVEMENT JOINT	LF	3,690
69	404093	SEAL ISOLATION JOINT	LF	4,700
70	025395	GRIND CONCRETE PAVEMENT (WEIGH IN MOTION)	SQYD	140
71	490601	16" CAST-IN-DRILLED-HOLE CONCRETE PILING	LF	297
72	498044	36" CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	LF	93
73	498050	54" CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	LF	88
74	498052	60" CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	LF	58
75 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	CY	40
76 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	CY	284
77 (F)	510086	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	CY	118
78 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	CY	140
79	519081	JOINT SEAL (MR 1/2")	LF	96
80 (F)	520102	BAR REINFORCING STEEL (BRIDGE)	LB	73,500

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	LB	146,400
82 (F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	LB	146,400
83	560233	FURNISH FORMED PANEL SIGN (OVERHEAD)	SQFT	1,280
84	560245	FURNISH LAMINATED PANEL SIGN (1"-TYPE B)	SQFT	210
85	560246	FURNISH LAMINATED PANEL SIGN (2 1/2"-TYPE B)	SQFT	130
86	560248	FURNISH SINGLE SHEET ALUMINUM SIGN (0.063"-UNFRAMED)	SQFT	140
87	560249	FURNISH SINGLE SHEET ALUMINUM SIGN (0.080"-UNFRAMED)	SQFT	460
88	560251	FURNISH SINGLE SHEET ALUMINUM SIGN (0.063"-FRAMED)	SQFT	180
89	560252	FURNISH SINGLE SHEET ALUMINUM SIGN (0.080"-FRAMED)	SQFT	280
90	566011	ROADSIDE SIGN - ONE POST	EA	38
91	566012	ROADSIDE SIGN - TWO POST	EA	18
92	568007	INSTALL SIGN OVERLAY	SQFT	28
93	568023	INSTALL ROADSIDE SIGN (LAMINATED WOOD BOX POST)	EA	1
94	650018	24" REINFORCED CONCRETE PIPE	LF	6,050
95	650026	36" REINFORCED CONCRETE PIPE	LF	760
96	650030	42" REINFORCED CONCRETE PIPE	LF	700
97	703233	GRATED LINE DRAIN	LF	92
98	705206	24" CONCRETE FLARED END SECTION	EA	2
99	705210	36" CONCRETE FLARED END SECTION	EA	2
100	705212	42" CONCRETE FLARED END SECTION	EA	4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
101	721013	ROCK SLOPE PROTECTION (1/4 T, METHOD B) (CY)	CY	48
102	721015	ROCK SLOPE PROTECTION (LIGHT, METHOD B) (CY)	CY	260
103	721623	CONCRETED-ROCK SLOPE PROTECTION (1/4 T, METHOD B) (CY)	CY	550
104	729012	ROCK SLOPE PROTECTION FABRIC (CLASS 10)	SQFT	6,470
105	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	CY	860
106	735000	PARKING BUMPER (PRECAST CONCRETE)	EA	17
107 (F)	750001	MISCELLANEOUS IRON AND STEEL	LB	16,100
108	760011	WELL DEVELOPMENT	LS	LUMP SUM
109	760012	TESTING WELL	HR	16
110	760021	DRILL PILOT HOLE	LF	975
111	760022	REAMING WATER WELL	LF	875
112	760025	CONDUCTOR CASING	LF	100
113	760030	BLANK WELL CASING	LF	975
114	760035	WELL SCREEN	LF	150
115	760090	MOBILIZATION, DEMOBILIZATION, AND FINAL CLEANUP	LS	LUMP SUM
116	025396	FENCE (TYPE DESERT TORTOISE) (TYPE 1)	LF	12,000
117	800360	CHAIN LINK FENCE (TYPE CL-6)	LF	120
118	802520	6' CHAIN LINK GATE (TYPE CL-6)	EA	2
119	802580	12' CHAIN LINK GATE (TYPE CL-6)	EA	1
120	810116	SURVEY MONUMENT (TYPE D)	EA	10

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
121	820107	DELINEATOR (CLASS 1)	EA	160
122	820130	OBJECT MARKER	EA	6
123	832003	METAL BEAM GUARD RAILING (WOOD POST)	LF	3,000
124	839541	TRANSITION RAILING (TYPE WB)	EA	4
125	839584	ALTERNATIVE IN-LINE TERMINAL SYSTEM	EA	2
126	839601	CRASH CUSHION (TYPE CAT)	EA	2
127	839602	CRASH CUSHION (TYPE CAT) BACKUP	EA	2
128 (F)	839720	CONCRETE BARRIER (TYPE 732)	LF	249
129	840515	THERMOPLASTIC PAVEMENT MARKING	SQFT	3,330
130	840560	THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE)	LF	103,000
131	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	1,750
132	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	2,040
133	860090	MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION	LS	LUMP SUM
134	860460	LIGHTING AND SIGN ILLUMINATION	LS	LUMP SUM
135	860604	FLASHING BEACON SYSTEM	LS	LUMP SUM
136	860771	COMMUNICATION CONDUIT (LS)	LS	LUMP SUM
137	861503	MODIFY LIGHTING	LS	LUMP SUM
138	025397	PRECAST CONCRETE TRASH RECEPTACLE	EA	11
139	994650	BUILDING WORK	LS	LUMP SUM
140	999990	MOBILIZATION	LS	LUMP SUM

SPECIAL PROVISIONS

SECTION 1. (BLANK)

SECTION 2. BIDDING

2-1.01 MANDATORY PREBID MEETING

The Department will conduct a mandatory prebid meeting for this contract. The purpose of the meeting is to provide small businesses the opportunity to meet and interact with prospective bidders and increase participation in the performance of contracts.

Prospective bidders must attend the mandatory prebid meeting. The bidder's representative must be a company officer, project superintendent, or project estimator. For a joint venture, one of the parties must attend the mandatory prebid meeting. The Department will not accept bids from bidders who do not attend the mandatory prebid meeting.

A sign-up sheet will be used to identify all prospective bidders including name and title of the company representative attending the mandatory prebid meeting. The Department may hold a single prebid meeting for more than one contract. Make sure you sign the sign-up sheet for each contract you intend to bid on.

The successful bidder will be required to report small businesses hired to work on this contract as a result of the mandatory prebid meeting.

2-1.02 TIE BID RESOLUTION

After bid verification, if there is a tie between 2 or more bidders, the Department breaks the tie by tossing a coin.

2-1.03 DISADVANTAGED BUSINESS ENTERPRISES

Under 49 CFR 26.13(b):

> The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

Take necessary and reasonable steps to ensure that DBEs have opportunity to participate in the contract (49 CFR 26).

To ensure equal participation of DBEs provided in 49 CFR 26.5, the Department shows a goal for DBEs.

Make work available to DBEs and select work parts consistent with available DBE subcontractors and suppliers.

Meet the DBE goal shown in the Notice to Bidders or demonstrate that you made adequate good faith efforts to meet this goal.

It is your responsibility to verify that the DBE firm is certified as DBE at date of bid opening. For a list of DBEs certified by the California Unified Certification Program, go to:

http://www.dot.ca.gov/hq/bep/find_certified.htm

All DBE participation will count toward the Department's federally mandated statewide overall DBE goal.

Credit for materials or supplies you purchase from DBEs counts towards the goal in the following manner:

1. 100 percent counts if the materials or supplies are obtained from a DBE manufacturer.
2. 60 percent counts if the materials or supplies are obtained from a DBE regular dealer.
3. Only fees, commissions, and charges for assistance in the procurement and delivery of materials or supplies count if obtained from a DBE that is neither a manufacturer or regular dealer. 49 CFR 26.55 defines "manufacturer" and "regular dealer."

You receive credit towards the goal if you employ a DBE trucking company that performs a commercially useful function as defined in 49 CFR 26.55(d)(1) through (4) and (6).

DBE Commitment Submittal

Submit DBE information on the Caltrans Bidder - DBE - Commitment form included in the Bid book. If the form is not submitted with the bid, remove the form from the Bid book before submitting your bid.

If the DBE Commitment form is not submitted with the bid, the apparent low bidder, the 2nd low bidder, and the 3rd low bidder must complete and submit the DBE Commitment form to Office Engineer. DBE Commitment form must be received by the Department no later than 4:00 p.m. on the 4th business day after bid opening.

Other bidders do not need to submit the DBE Commitment form unless the Department requests it. If the Department requests you to submit a DBE Commitment form, submit the completed form within 4 business days of the request.

Submit written confirmation from each DBE stating that it is participating in the contract. Include confirmation with the DBE Commitment form. A copy of a DBE's quote will serve as written confirmation that the DBE is participating in the contract.

If you do not submit the DBE Commitment form within the specified time, the Department finds your bid nonresponsive.

Good Faith Efforts Submittal

If you have not met the DBE goal, complete and submit the Good Faith Efforts Documentation form with the bid showing that you made adequate good faith efforts to meet the goal. Only good faith efforts directed towards obtaining participation by DBEs will be considered. If good faith efforts documentation is not submitted with the bid, it must be received by the Department no later than 4:00 p.m. on the 4th business day after bid opening.

If your DBE Commitment form shows that you have met the DBE goal or if you are required to submit the DBE Commitment form, you must also submit good faith efforts documentation within the specified time to protect your eligibility for award of the contract in the event the Department finds that the DBE goal has not been met.

Good faith efforts documentation must include the following information and supporting documents, as necessary:

1. Items of work you have made available to DBE firms. Identify those items of work you might otherwise perform with its own forces and those items that have been broken down into economically feasible units to facilitate DBE participation. For each item listed, show the dollar value and percentage of the total contract. It is your responsibility to demonstrate that sufficient work to meet the goal was made available to DBE firms.
2. Names of certified DBEs and dates on which they were solicited to bid on the project. Include the items of work offered. Describe the methods used for following up initial solicitations to determine with certainty if the DBEs were interested, and the dates of the follow-up. Attach supporting documents such as copies of letters, memos, facsimiles sent, telephone logs, telephone billing statements, and other evidence of solicitation. You are reminded to solicit certified DBEs through all reasonable and available means and provide sufficient time to allow DBEs to respond.
3. Name of selected firm and its status as a DBE for each item of work made available. Include name, address, and telephone number of each DBE that provided a quote and their price quote. If the firm selected for the item is not a DBE, provide the reasons for the selection.
4. Name and date of each publication in which you requested DBE participation for the project. Attach copies of the published advertisements.
5. Names of agencies and dates on which they were contacted to provide assistance in contacting, recruiting, and using DBE firms. If the agencies were contacted in writing, provide copies of supporting documents.
6. List of efforts made to provide interested DBEs with adequate information about the plans, specifications, and requirements of the contract to assist them in responding to a solicitation. If you have provided information, identify the name of the DBE assisted, the nature of the information provided, and date of contact. Provide copies of supporting documents, as appropriate.
7. List of efforts made to assist interested DBEs in obtaining bonding, lines of credit, insurance, necessary equipment, supplies, and materials, excluding supplies and equipment that the DBE subcontractor purchases or leases from the prime contractor or its affiliate. If such assistance is provided by you, identify the name of the DBE assisted, nature of the assistance offered, and date assistance was provided. Provide copies of supporting documents, as appropriate.
8. Any additional data to support demonstration of good faith efforts.

The Department may consider DBE commitments of the 2nd and 3rd bidders when determining whether the low bidder made good faith efforts to meet the DBE goal.

2-1.04 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

You may opt out of the payment adjustments for price index fluctuations as specified in "Payment Adjustments for Price Index Fluctuations" of these special provisions. If you elect to opt out of the provisions of this specification, you must complete the "Opt Out of Payment Adjustments for Price Index Fluctuations" form. The completed form must be submitted with your bid.

SECTION 3. CONTRACT AWARD AND EXECUTION

3-1.01 CONTRACT AWARD

If the Department awards the Contract, the award is made to the lowest responsible bidder within 60 days.

3-1.02 SMALL BUSINESS PARTICIPATION REPORT

The Department has established an overall 25 percent small business participation goal. To determine if the goal is achieved, the Department is tracking small business participation on all contracts.

Complete and sign the Small Business (SB) Participation Report form included in the contract documents even if no small business participation is reported. Submit it with the executed contract.

3-1.03 CALTRANS BIDDER - DBE INFORMATION FORM

Complete and sign the Caltrans Bidder - DBE Information form included in the contract documents even if no DBE participation is reported. Submit it with the executed contract.

Provide written confirmation from each DBE that the DBE is participating in the contract. A copy of a DBE's quote serves as written confirmation. If a DBE is participating as a joint venture partner, the Department encourages you to submit a copy of the joint venture agreement.

SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

Complete the work, except plant establishment work, within 340 working days starting on the 15th day after contract approval or on the day you start work at the job site, whichever occurs first.

Complete the work, including plant establishment work, within 590 working days starting on the 15th day after contract approval or on the day you start work at the job site, whichever occurs first.

SECTION 5. GENERAL

5-1.01 EMISSIONS REDUCTION

Contract execution constitutes submittal of the following certification:

> I am aware of the emissions reduction regulations being mandated by the California Air Resources Board. I will comply with such regulations before commencing the performance of the work and maintain compliance throughout the duration of this contract.

5-1.02 BUY AMERICA

The specifications in Section 6-1.085, "Buy America (23 CFR 635.410)," of the Amendments to the Standard Specifications for furnishing steel and iron materials to be incorporated into the work apply to this contract.

5-1.03 SUBCONTRACTOR AND DISADVANTAGED BUSINESS ENTERPRISE RECORDS

Use each DBE subcontractor as listed on the Subcontractor List form and the Caltrans Bidder - DBE Information form unless you receive authorization for a substitution.

The Department requests the Contractor to:

1. Notify the Engineer of any changes to its anticipated DBE participation
2. Provide this notification before starting the affected work

Maintain records including:

1. Name and business address of each 1st-tier subcontractor

2. Name and business address of each DBE subcontractor, DBE vendor, and DBE trucking company, regardless of tier
3. Date of payment and total amount paid to each business

If you are a DBE contractor, include the date of work performed by your own forces and the corresponding value of the work.

Before the 15th of each month, submit a Monthly DBE Trucking Verification form.

If a DBE is decertified before completing its work, the DBE must notify you in writing of the decertification date. If a business becomes a certified DBE before completing its work, the business must notify you in writing of the certification date. Submit the notifications. On work completion, complete a Disadvantaged Business Enterprises (DBE) Certification Status Change form. Submit the form within 30 days of contract acceptance.

Upon work completion, complete a Final Report – Utilization of Disadvantaged Business Enterprises (DBE), First-Tier Subcontractors form. Submit it within 90 days of contract acceptance. The Department withholds $10,000 until the form is submitted. The Department releases the withhold upon submission of the completed form.

5-1.04 PERFORMANCE OF DISADVANTAGED BUSINESS ENTERPRISES

DBEs must perform work or supply materials as listed in the Caltrans Bidder - DBE - Commitment form specified in Section 2, "Bidding," of these special provisions.

Do not terminate or substitute a listed DBE for convenience and perform the work with your own forces or obtain materials from other sources without authorization from the Department.

The Department authorizes a request to use other forces or sources of materials if it shows any of the following justifications:

1. Listed DBE fails or refuses to execute a written contract based on plans and specifications for the project.
2. You stipulated that a bond is a condition of executing the subcontract and the listed DBE fails to meet your bond requirements.
3. Work requires a contractor's license and listed DBE does not have a valid license under Contractors License Law.
4. Listed DBE fails or refuses to perform the work or furnish the listed materials.
5. Listed DBE's work is unsatisfactory and not in compliance with the contract.
6. Listed DBE is ineligible to work on the project because of suspension or debarment.
7. Listed DBE becomes bankrupt or insolvent.
8. Listed DBE voluntarily withdraws with written notice from the Contract
9. Listed DBE is ineligible to receive credit for the type of work required.
10. Listed DBE owner dies or becomes disabled resulting in the inability to perform the work on the Contract.
11. Department determines other documented good cause.

Notify the original DBE of your intent to use other forces or material sources and provide the reasons. Provide the DBE with 5 days to respond to your notice and advise you and the Department of the reasons why the use of other forces or sources of materials should not occur. Your request to use other forces or material sources must include:

1. 1 or more of the reasons listed in the preceding paragraph
2. Notices from you to the DBE regarding the request
3. Notices from the DBE to you regarding the request

If a listed DBE is terminated or substituted, make good faith efforts to find another DBE to substitute for the original DBE. The substitute DBE must perform at least the same amount of work as the original DBE under the contract to the extent needed to meet the DBE goal.

The substitute DBE must be certified as a DBE at the time of request for substitution.

Unless the Department authorizes (1) a request to use other forces or sources of materials or (2) a good faith effort for a substitution of a terminated DBE, the Department does not pay for work listed on the Caltrans Bidder - DBE - Commitment form unless it is performed or supplied by the listed DBE or an authorized substitute.

5-1.05 PARTNERING DISPUTE RESOLUTION

The Department encourages the project team to exhaust the use of partnering in dispute resolution before engagement of an objective third party. Comply with Section 5-1.012, "Partnering," of the Standard Specifications.

For certain disputes, facilitated partnering session or facilitated dispute resolution session may be appropriate and effective in clarifying issues and resolving all or part of a dispute.

To afford the project team enough time to plan and hold the session, a maximum of 20 days may be added to the dispute resolution board (DRB) referral time following the Engineer's written response to a supplemental potential claim record as specified in Section 5-1.15, "Dispute Resolution," of the Standard Specifications.

To allow this additional referral time, the project team must document its agreement and intention in the dispute resolution plan of the partnering charter. The team may further document agreement of any associated criteria to be met for use of the additional referral time.

If the session is not held, the DRB referral time remains in effect as specified in Section 5-1.15, "Dispute Resolution," of the Standard Specifications.

5-1.06 PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

GENERAL

Summary

This section applies to asphalt contained in materials for pavement structural sections and pavement surface treatments such as hot mix asphalt (HMA), tack coat, asphaltic emulsions, bituminous seals, asphalt binders, and modified asphalt binders placed in the work. This section does not apply if you opted out of payment adjustment for price index fluctuations at the time of bid.

The Engineer adjusts payment if the California Statewide Crude Oil Price Index for the month the material is placed is more than 5 percent higher or lower than the price index at the time of bid.

The California Statewide Crude Oil Price Index is determined each month on or about the 1st business day of the month by the Department using the average of the posted prices in effect for the previous month as posted by Chevron, ExxonMobil, and ConocoPhillips for the Buena Vista, Huntington Beach, and Midway Sunset fields.

If a company discontinues posting its prices for a field, the Department determines the index from the remaining posted prices. The Department may include additional fields to determine the index.

For the California Statewide Crude Oil Price Index, go to:

http://www.dot.ca.gov/hq/construc/crudeoilindex/

If the adjustment is a decrease in payment, the Department deducts the amount from the monthly progress payment.

The Department includes payment adjustments for price index fluctuations when making adjustments under Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

If you do not complete the work within the contract time, payment adjustments during the overrun period are determined using the California Statewide Crude Oil Price Index in effect for the month in which the overrun period began.

If the price index at the time of placement increases:

1. 50 percent or more over the price index at bid opening, notify the Engineer.
2. 100 percent or more over the price index at bid opening, do not furnish material containing asphalt until the Engineer authorizes you to proceed with that work. The Department may decrease Bid item quantities, eliminate Bid items, or terminate the contract.

Submittals

Before placing material containing asphalt, submit the current sales and use tax rate in effect in the tax jurisdiction where the material is to be placed.

Submit certified weight slips for HMA, tack coat, asphaltic emulsions, and modified asphalt binders, including those materials not paid for by weight, as specified in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications. For slurry seals, submit certified weight slips separately for the asphaltic emulsion.

ASPHALT QUANTITIES

General

Interpret the term "ton" as "tonne" for projects using metric units.

Hot Mix Asphalt

The Engineer calculates the quantity of asphalt in HMA using the following formula:

Qh = HMATT x [Xa / (100 + Xa)]

where:

Qh =	quantity in tons of asphalt used in HMA
HMATT =	HMA total tons placed
Xa =	theoretical asphalt content from job mix formula expressed as percentage of the weight of dry aggregate

Rubberized Hot Mix Asphalt

The Engineer calculates the quantity of asphalt in rubberized HMA (RHMA) using the following formula:

Qrh = RHMATT x 0.80 x [Xarb / (100 + Xarb)]

where:

Qrh =	quantity in tons of asphalt in asphalt rubber binder used in RHMA
RHMATT =	RHMA total tons placed
Xarb =	theoretical asphalt rubber binder content from the job mix formula expressed as percentage of the weight of dry aggregate

Modified Asphalt Binder in Hot Mix Asphalt

The Engineer calculates the quantity of asphalt in modified asphalt binder using the following formula:

Qmh = MHMATT x [(100 - Xam) / 100] x [Xmab / (100 + Xmab)]

where:

Qmh =	quantity in tons of asphalt in modified asphalt binder used in HMA
MHMATT =	modified asphalt binder HMA total tons placed
Xam =	specified percentage of asphalt modifier
Xmab =	theoretical modified asphalt binder content from the job mix formula expressed as percentage of the weight of dry aggregate

Hot Mix Asphalt Containing Reclaimed Asphalt Pavement (RAP)

The Engineer calculates the quantity of asphalt in HMA containing RAP using the following formulas:

Qrap = HMATT x [Xaa / (100 + Xaa)]

where:

Xaa = Xta - [(100 -Xnew) x (Xra / 100)]

and

Qrap =	quantity in tons of asphalt used in HMA containing RAP
HMATT =	HMA total tons placed
Xaa =	asphalt content of HMA adjusted to account for the asphalt content in RAP expressed as percentage of the weight of dry aggregate
Xta =	total asphalt content of HMA expressed as percentage of the weight of dry aggregate
Xnew =	theoretical percentage of new aggregate in the HMA containing RAP determined from RAP percentage in the job mix formula
Xra =	asphalt content of RAP expressed as percentage

Tack Coat

The Engineer calculates the quantity of asphalt in tack coat (Qtc) as either:

1. Asphalt binder using the asphalt binder total tons placed as tack coat
2. Asphaltic emulsion by applying the formula in "Asphaltic Emulsion" to the asphaltic emulsion total tons placed as tack coat

Asphaltic Emulsion

The Engineer calculates the quantity of asphalt in asphaltic emulsions, including fog seals and tack coat, using the following formula:

Qe = AETT x (Xe / 100)

where:

Qe = quantity in tons of asphalt used in asphaltic emulsions
AETT = undiluted asphaltic emulsions total tons placed
Xe = minimum percent residue specified in Section 94, "Asphaltic Emulsions," of the Standard Specifications based on the type of emulsion used

You may, as an option, determine "Xe" by submitting actual daily test results for asphalt residue for the asphaltic emulsion used. If you choose this option, you must:

1. Take 1 sample every 200 tons but not less than 1 sample per day in the presence of the Engineer from the delivery truck, at midload from a sampling tap or thief, and in the following order:

   1.1. Draw and discard the 1st gallon
   1.2. Take two separate 1/2-gallon samples

2. Submit 1st sample at the time of sampling
3. Provide 2nd sample within 3 business days of sampling to an independent testing laboratory that participates in the AASHTO Proficiency Sample Program
4. Submit test results from independent testing laboratory within 10 business days of sample date

Slurry Seal

The Engineer calculates the quantity of asphalt in slurry seals (Qss) by applying the formula in "Asphaltic Emulsion" to the actual quantity of asphaltic emulsion used in producing the slurry seal mix.

Modified Asphalt Binder

The Engineer calculates the quantity of asphalt in modified asphalt binder using the following formula:

Qmab = MABTT x [(100 - Xam) / 100]

where:

Qmab = quantity in tons of asphalt used in modified asphalt binder
MABTT = modified asphalt binder total tons placed
Xam = specified percentage of asphalt modifier

Other Materials

For other materials containing asphalt not covered above, the Engineer determines the quantity of asphalt (Qo).

PAYMENT ADJUSTMENTS

The Engineer includes payment adjustments for price index fluctuations in progress pay estimates. If material containing asphalt is placed within 2 months during 1 estimate period, the Engineer calculates 2 separate adjustments. Each adjustment is calculated using the price index for the month in which the quantity of material containing asphalt subject to adjustment is placed in the work. The sum of the 2 adjustments is used for increasing or decreasing payment in the progress pay estimate.

The Engineer calculates each payment adjustment as follows:

PA = Qt x A

where:

PA = Payment adjustment in dollars for asphalt contained in materials placed in the work for a given month.

Qt = Sum of quantities of asphalt (Qh + Qrh + Qmh + Qrap + Qtc + Qe + Qss + Qmab + Qo).

A = Adjustment in dollars per ton of asphalt used to produce materials placed in the work rounded to the nearest $0.01.

For US Customary projects, use:

A = [(Iu / Ib) - 1.05] x Ib x [1 + (T / 100)] for an increase in the crude oil price index exceeding 5 percent
A = [(Iu / Ib) - 0.95] x Ib x [1 + (T / 100)] for a decrease in the crude oil price index exceeding 5 percent

For metric projects, use:

A = 1.1023 x [(Iu / Ib) - 1.05] x Ib x [1 + (T / 100)] for an increase in the crude oil price index exceeding 5 percent
A = 1.1023 x [(Iu / Ib) - 0.95] x Ib x [1 + (T / 100)] for a decrease in the crude oil price index exceeding 5 percent

Iu = California Statewide Crude Oil Price Index for the month in which the quantity of asphalt subject to adjustment was placed in the work.
Ib = California Statewide Crude Oil Price Index for the month in which the bid opening for the project occurred
T = Sales and use tax rate, expressed as a percent, currently in effect in the tax jurisdiction where the material is placed. If the tax rate information is not submitted timely, the statewide sales and use tax rate is used in the payment adjustment calculations until the tax rate information is submitted.

5-1.07 SURFACE MINING AND RECLAMATION ACT

Imported borrow or aggregate material must come from a surface mine permitted under the Surface Mining and Reclamation Act of 1975 (SMARA), Pub Res Code § 2710, et seq., or from an exempt site.

The Department of Conservation, Office of Mine Reclamation maintains a list of permitted mine sites. For the list of permitted sites, go to:

http://www.conservation.ca.gov/omr/ab_3098_list

If you import borrow or aggregate material from a surface mine not on this list, submit proof the mine is exempt from SMARA.

5-1.08 ELECTRONIC SUBMISSION OF PAYROLL RECORDS

In lieu of submitting weekly payroll records to the Engineer as specified in Section 7-1.01A(3), "Payroll Records," of the Standard Specifications, you may submit weekly payroll records electronically.

Before submitting payroll records electronically, you must complete and sign the Contractor's Acknowledgement and submit it to the District where your project is located. Submit your signed acknowledgement to the corresponding District electronic mailbox shown in the following table:

Electronic Mailboxes

District	Address
1	district1.payrolls@dot.ca.gov
2	district2.payrolls@dot.ca.gov
3	district3.payrolls@dot.ca.gov
4	district4.payrolls@dot.ca.gov
5	district5.payrolls@dot.ca.gov
6	district6.payrolls@dot.ca.gov
7	district7.payrolls@dot.ca.gov
8	district8.payrolls@dot.ca.gov
9	district9.payrolls@dot.ca.gov
10	district10.payrolls@dot.ca.gov
11	district11.payrolls@dot.ca.gov
12	district12.payrolls@dot.ca.gov

The Department responds with an e-mail containing a Caltrans Internet Certificate to be used for the electronic submission of payroll records. You must agree to accept this certificate and reply to the e-mail. After you accept the certificate and reply to the e-mail, the Department is ready to accept your electronic submissions.

Each electronic submission must:

1. Include payroll records in a nonmodifiable PDF image format. No spreadsheets, word documents, or password protected documents are accepted.
2. Include payroll records with all data elements required by the Labor Code § 1776.
3. Include a signed Statement of Compliance form with each weekly record.
4. Be received by the Department by close of business on the 15th day of the month for the prior month's work.
5. Be encrypted before submission.
6. Contain the following information in the subject line:

   6.1. Contract number
   6.2. Week ending date as W/E mm/dd/yy

7. Contain 1 contract number and week ending date per submission.

For additional information on electronic submission of payroll records, go to:

http://www.dot.ca.gov/hq/construc/LaborCompliance/index.htm

5-1.09 FORCE ACCOUNT PAYMENT

Payment for extra work at force account will be determined by either non-subcontracted or subcontracted force account payment unless otherwise specified.

Non-Subcontracted Force Account Payment

When extra work to be paid for on a force account basis is performed by the Contractor, compensation will be determined as specified in Section 9-1.03, "Force Account Payment," of the Standard Specifications except for the markups. The markups specified in Section 9-1.03B, "Labor," Section 9-1.03C, "Materials," and Section 9-1.03D, "Equipment Rental" are changed to the following markups:

Cost	Percent Markup
Labor	30
Materials	10
Equipment Rental	10

The above markups shall be applied to work performed on a force account basis, regardless of whether the work revises the current contract completion date.

The above markups, together with payments made for time-related overhead under "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis.

Full compensation for overhead costs for work performed on a force account basis, and for which no adjustment is made to the quantity for time-related overhead conforming to the provisions in "Time-Related Overhead" of these special provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

Subcontracted Force Account Payment

When extra work to be paid for on a force account basis is performed by a subcontractor approved in conformance with the provisions in Section 5-1.055, "Subcontracting," of the Standard Specifications, compensation will be determined in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

5-1.10 AREAS FOR CONTRACTOR'S USE

Attention is directed to the provisions in Section 7-1.19, "Rights in Land and Improvements," of the Standard Specifications and these special provisions.

The highway right of way shall be used only for purposes that are necessary to perform the required work. The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work.

No State-owned parcels adjacent to the right of way are available for the exclusive use of the Contractor within the contract limits. The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials, or for other purposes.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on State property may be arranged with the Engineer, subject to the prior demands of State maintenance forces and to other contract requirements. Use of the Contractor's work areas and other State-owned property shall be at the Contractor's own risk, and the State shall not be held liable for damage to or loss of materials or equipment located within such areas.

5-1.11 PAYMENTS

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

A. Rock Slop Protection Fabric
B. Fence
C. Metal Beam Guard Railing (Wood Post)
D. Pavement Marker
E. Bar Reinforcing Steel
F. Lighting Standards
G. Luminaires
H. Lighting Fixtures
I. Irrigation Controller Enclosure Cabinets
J. Corrugated Steel Pipe Conduit
K. Miscellaneous Iron and Steel

5-1.12 SUPPLEMENTAL PROJECT INFORMATION

The Department makes the following supplemental project information available:

Supplemental Project Information

Means	Description
Included in the Information Handout	1. Foundation Recommendations, Commercial Vehicle Enforcement Facility (June 26, 2002) 2. Geotechnical Design Report for Overhead Sign Structures (March 7, 2008) 3. Revised Foundation Report, Ivanpah Ditch (AIF Truck), Bridge No. 54-1215K (May 6, 2008) 4. Revised Foundation Report, Ivanpah Ditch (AIF Truck), Bridge No 54-1215J (May 6, 2008) 5. Bridge Foundation Review for Bridge No 54-1215K and Bridge No 54-1216J dated December 22, 2008 6. Final Materials Report (July 28, 2008) 7. California Regional Water Quality Control Board, Lahontan Region dated April 20, 2011 8. California Department of Fish and Game Streambed Alteration Agreement Section 1602 Permit 9. California Department of Fish and Game Incidental Take Section 2081 Permit 10. Weigh Station Bypass file formats 11. Fire Alarn Testing Form 12. State Fire Marshall extension dated November 6, 2012 13. State Fire Marshall extension dated January 30, 2013 14. United States Department of the Interior, Fish and Wildlife Service (Biological Opinion) dated October 1, 2010 15. California Department of Public Health dated July 25, 2011
Available as specified in the Standard Specifications	Cross sections Bridge as-built drawings

5-1.13 WATER CONSERVATION

Attention is directed to the various sections of the Standard Specifications and these special provisions which require the use of water for the construction of this project. Attention is directed to Section 7, "Legal Relations and Responsibility," of the Standard Specifications with regards to the Contractor's responsibilities for public convenience, public safety, preservation of property, indemnification, and insurance.

Nothing in this section "Water Conservation" shall relieve the Contractor from furnishing an adequate supply of water required for the proper construction of this project in conformance with the provisions in the Standard Specifications or these special provisions or relieve the Contractor from the legal responsibilities defined in Section 7.

The Contractor shall, whenever possible and not in conflict with the above requirements, minimize the use of water during construction of the project. Watering equipment shall be kept in good working order; water leaks shall be repaired promptly; and washing of equipment, except when necessary for safety or for the protection of equipment, shall be discouraged.

Minor concrete (minor structure), and minor concrete (miscellaneous construction) shall not be cured by using water. The water cure for bridge decks shall be accomplished with the use of a moisture retaining medium in conformance with the provisions in Section 90-7.01A, "Water Method," of the Standard Specifications.

When ordered by the Engineer, a dust palliative conforming to the provisions in Section 18, "Dust Palliative," of the Standard Specifications shall be used to control dust on this project. Dust palliative ordered by the Engineer will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

5-1.14 SPECIES PROTECTION

GENERAL

Summary

This work includes protecting regulated species or their habitat.

This project is within or near habitat for regulated species:

Desert Tortoise (Gopherus Agassizii)

CONSTRUCTION

Protective Radius

Upon discovery of a regulated species, stop construction activities within a 50 radius of the discovery. Immediately notify the Engineer. Do not resume activities until receiving written notification from the Engineer.

Protocols

Use protocols required by PLACs or, when not specified, use:

Regulated Species Name	Protocol
Desert Tortoise	Guidelines for Handling Desert Tortoises during Construction Projects (Handling Guidelines) (Desert Tortoise Council 1994, revised 1999).

MEASUREMENT AND PAYMENT

Full compensation for Species Protection is included in the contract lump sum price paid for Contractor Supplied Biologist and no additional compensation will be allowed.

Full compensation for Species Protection is included in the various contract items of work and no additional compensation will be allowed.

5-1.15 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

This project lies within the boundaries of the Lahontan Regional Water Quality Control Board (RWQCB).

The State Water Resources Control Board (SWRCB) has issued to the Department a permit that governs storm water and non-storm water discharges from the Department's properties, facilities, and activities. The Department's permit is entitled "Order No. 99 - 06 - DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)." Copies of the Department's permit are available for review from the SWRCB, Division of Water Quality, 1001 "I" Street, P.O. Box 100, Sacramento, California 95812-0100, Telephone fax: (916) 341-5463 and may also be obtained at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/caltrans.shtml

The Department's permit references and incorporates by reference the current statewide general permit issued by the SWRCB entitled "Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities" that regulates discharges of storm water and non-storm water from construction activities disturbing one acre or more of soil in a common plan of development. Copies of the statewide permit and modifications thereto are available for review from the SWRCB, Division of Water Quality, 1001 "I" Street, P.O. Box 100, Sacramento, California 95812-0100, Telephone fax: (916) 341-5463 and may also be obtained at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

The NPDES permits that regulate this project, as referenced above, are collectively referred to in this section as the "permits."

This project shall conform to the permits and modifications thereto. The Contractor shall maintain copies of the permits at the project site and shall make them available during construction.

The Contractor shall know and comply with provisions of Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 7-1.01, "Laws to be Observed," 5-1.18, "Property and Facility Preservation," 7-1.12, "Indemnification and Insurance," and 9-1.07E(5), "Penalty Withholds," of the Standard Specifications.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Department shall provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.

5-1.16 BORROW, DISPOSAL AND MATERIAL SITES

The operation of a borrow or disposal site used by the Contractor to produce or dispose of material for this project shall comply with the requirements in the Standard Specifications and these special provisions. Provisions for water pollution, air pollution, and sound control that apply within the limits of the contract shall apply to borrow or disposal sites utilized by the Contractor.

Borrow sites which are upwind of a city, town or other grouping of human habitations and within 1/2 mile of the city, town or other grouping of human habitations shall not be used to produce material for this project. Determination of upwind direction shall be based on the direction of prevailing winds, which in the area of this project is approximately westerly. Regardless of the wind direction, no site shall be used to produce or dispose of material for this project that is closer than 300 feet to a public highway, business, human habitation or recreation area.

Temporary haul roads shall be surfaced or watered and otherwise maintained so that no dust nuisance is created, in conformance with the provisions in Section 10, "Dust Control," of the Standard Specifications. Operations at the site shall be confined to as small an area as is practicable. Vegetation, desert crust, and other natural features outside the operating area shall be protected from damage by the Contractor's operations.

The sites and haul roads shall be graded and treated so that, at the time of final inspection of the contract, the site and haul roads will drain, will blend with the surrounding terrain, and will not provide a potential source of blowing dust or other pollution greater than their original potential, as determined by the Engineer.

The number of working days allowed for this project includes time to remove equipment, if required, and to restore the borrow site to its natural condition. No additional time will be allowed therefor.

If the Contractor obtains the necessary permits for borrow, disposal or material sites from the city or county having jurisdiction or from the appropriate pollution control boards and such permits contain requirements which conflict with the requirements in the second, third and fourth paragraphs of this section, the requirements of the permits shall govern over the conflicting requirements of this section.

Full compensation for complying with the requirements for borrow, disposal, and material sites in this section shall be considered as included in the prices paid for the contract items of work which require the use of the sites and no additional compensation will be allowed therefor.

5-1.17 NONHIGHWAY FACILITIES (INCLUDING UTILITIES)

Installation of the utilities shown in the following table requires coordination with your activities. Make the necessary arrangements with the utility company through the Engineer and submit a schedule:

1. Verified by a representative of the utility company
2. Allowing at least the time shown for the utility owner to complete its work

Utility Relocation and Contractor-Arranged Time for the Relocation

Utility	Utility Address	Location	Days
Sprint Fiber Optic	ATTN: Lynn Durrett 282 South Sycamore Avenue, Rialto, CA 92376	Southbound Interstate 15, PM 177.3 to PM 181.1	30
AT&T Fiber Optic	ATTN: Glen Sels 22311 Brookhurst Street, Huntington Beach, CA 92646	Southbound Interstate 15, PM 177.3 to PM 181.1	45

5-1.18 DAMAGE REPAIR

Attention is directed to Section 7-1.16, "Contractor's Responsibility for the Work and Materials," and Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications and these special provisions.

When as a result of freezing conditions (as defined herein) during the plant establishment period, plants have died or, in the opinion of the Engineer, have deteriorated to a point beyond which the plants will not mature as typical examples of their species, the Engineer may direct replacement of the affected plants. The total cost of ordered plant replacement work will be paid for as extra work as provided in Section 4-1.03D,"Extra Work," of the Standard Specifications. A freezing condition, for the purpose of this specification, occurs when the temperature at or near the affected area has been officially recorded below 32° F and plants have been killed or damaged to the degree described above.

When, as a result of drought conditions (as defined herein) during the plant establishment period, plants have died or, in the opinion of the Engineer, have deteriorated to a point beyond which the plants will not mature as typical examples of their species, the Engineer may direct replacement of the affected plants. The total cost of ordered plant replacements, after water has been restricted or stopped, will be paid for as extra work as provided in Section 4-1.03D,"Extra Work," of the Standard Specifications. Restriction or shutoff of available water shall not relieve the Contractor from performing other contract work. A drought condition occurs when the Department, or its supplier, restricts or stops delivery of water to the Contractor to the degree that plants have died or deteriorated as described above.

When the provisions in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications are applicable, the provisions above for payment of costs for repair of damage due to rain, freezing conditions and drought shall not apply.

5-1.19 RELIEF FROM MAINTENANCE AND RESPONSIBILITY

The Contractor may be relieved of the duty of maintenance and protection for those items not directly connected with plant establishment work in conformance with the provisions in Section 7-1.15, "Relief From Maintenance and Responsibility," of the Standard Specifications. Water pollution control, maintain existing planted areas, maintain existing irrigation facilities, transplant trees, and transplant palm trees shall not be relieved of maintenance.

SECTION 6. (BLANK)

SECTION 7. (BLANK)

SECTION 8. MATERIALS

SECTION 8-1. MISCELLANEOUS

8-1.01 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS

The Department maintains the following list of Prequalified and Tested Signing and Delineation Materials. The Engineer shall not be precluded from sampling and testing products on the list of Prequalified and Tested Signing and Delineation Materials.

The manufacturer of products on the list of Prequalified and Tested Signing and Delineation Materials shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

For those categories of materials included on the list of Prequalified and Tested Signing and Delineation Materials, only those products shown within the listing may be used in the work. Other categories of products, not included on the list of Prequalified and Tested Signing and Delineation Materials, may be used in the work provided they conform to the requirements of the Standard Specifications.

Materials and products may be added to the list of Prequalified and Tested Signing and Delineation Materials if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

PAVEMENT MARKERS, PERMANENT TYPE

Retroreflective With Abrasion Resistant Surface (ARS)

("length along the direction of travel" x "marker width")

1. Apex, Model 921AR (4" x 4")
2. Ennis-Flint, Models C88 (4" x 4"), 911 (4" x 4") and C80FH (3.1" x 4.5")
3. Ray-O-Lite, Models "AA" ARC II (4" x 4") and ARC Round Shoulder (4" x 4")
4. 3M Series 290 (3.5" x 4")
5. 3M Series 290 PSA
6. Glowlite, Inc Model 988AR (4" x 4")

Retroreflective With Abrasion Resistant Surface (ARS)

(for recessed applications only)

1. Ennis-Flint, Model 948 (2.3" x 4.7")
2. Ennis-Flint, Model 944SB (2" x 4")*
3. Ray-O-Lite, Model 2002 (2" x 4.6")
4. Ray-O-Lite, Model 2004 (2" x 4")*

*For use only in 4.5 inch wide (older) recessed slots

Non-Reflective, 4-inch Round

1. Apex Universal (Ceramic)
2. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
3. Glowlite, Inc. (Ceramic) and PP (Polypropylene)
4. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
5. Interstate Sales, "Diamond Back" (Polypropylene)
6. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
7. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
8. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)
9. Ray-O-Lite, Ray-O-Dot (Polypropylene)

PAVEMENT MARKERS, TEMPORARY TYPE

Temporary Markers For Long Term Day/Night Use (180 days or less)

1. Vega Molded Products "Temporary Road Marker" (3" x 4")
2. Pexco LLC, Halftrack model 25, 26 and 35

Temporary Markers For Short Term Day/Night Use (14 days or less)

(For seal coat or chip seal applications, clear protective covers are required)

1. Apex Universal, Model 932
2. Pexco LLC, Models T.O.M., T.R.P.M., and "HH" (High Heat)
3. Hi-Way Safety, Inc., Model 1280/1281
4. Glowlite, Inc., Model 932

STRIPING AND PAVEMENT MARKING MATERIAL

Permanent Traffic Striping and Pavement Marking Tape

1. Advanced Traffic Marking, Series 300 and 400
2. Brite-Line, Series 1000
3. Brite-Line, "DeltaLine XRP"
4. Swarco Industries, "Director 35" (For transverse application only)
5. Swarco Industries, "Director 60"
6. 3M, "Stamark" Series 380 and 270 ES
7. 3M, "Stamark" Series 420 (For transverse application only)

Temporary (Removable) Striping and Pavement Marking Tape (180 days or less)

1. Advanced Traffic Marking, Series 200
2. Brite-Line, "Series 100", "Deltaline TWR"
3. Garlock Rubber Technologies, Series 2000
4. Tape 4, Aztec, Grade 102

5. Swarco Industries, "Director-2", "Director 2-Wet Reflective"
6. Trelleborg Industries, R140 Series
7. 3M Series 620 "CR", Series 780 and Series 710
8. 3M Series A145, Removable Black Line Mask
   (Black Tape: for use only on Hot mix asphalt surfaces)
9. Advanced Traffic Marking Black "Hide-A-Line"
   (Black Tape: for use only on Hot mix asphalt surfaces)
10. Brite-Line "BTR" Black Removable Tape
    (Black Tape: for use only on Hot mix asphalt surfaces)
11. Trelleborg Industries, RB-140
    (Black Tape: for use only on Hot mix asphalt surfaces)

Preformed Thermoplastic (Heated in place)

1. Ennis-Flint, "Hot Tape"
2. Ennis-Flint, "Premark Plus"
3. Ennis-Flint, "Flametape"

Ceramic Surfacing Laminate, 6" x 6"

1. Highway Ceramics, Inc.

CLASS 1 DELINEATORS

One Piece Driveable Flexible Type, 66-inch

1. Pexco LLC, "Flexi-Guide Models 400 and 566"
2. Carsonite, Curve-Flex CFRM-400
3. Carsonite, Roadmarker CRM-375
4. FlexStake, Model 654 TM
5. GreenLine Model CGD1-66

Special Use Type, 66-inch

1. Pexco LLC, Model FG 560 (with 18-inch U-Channel base)
2. Carsonite, "Survivor" (with 18-inch U-Channel base)
3. Carsonite, Roadmarker CRM-375 (with 18-inch U-Channel base)
4. FlexStake, Model 604
5. GreenLine Model CGD (with 18-inch U-Channel base)
6. Impact Recovery Model D36, with #105 Driveable Base
7. Safe-Hit with 8-inch pavement anchor (SH248-GP1)
8. Safe-Hit with 15-inch soil anchor (SH248-GP2) and with 18-inch soil anchor (SH248-GP3)
9. Safe-Hit RT 360 Post with Soil Mount Anchor (GPS)
10. Shur-Tite Products, Shur-Flex Drivable

Surface Mount Type, 48-inch

1. Bent Manufacturing Company, Masterflex Model MFEX 180-48
2. Carsonite, "Channelizer"
3. FlexStake, Models 704, 754 TM, and EB4
4. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
5. Three D Traffic Works "Channelflex" ID No. 522248W
6. Flexible Marker Support, Flexistiff Model C-9484
7. Safe-Hit, SH 248 SMR

CHANNELIZERS

Surface Mount Type, 36-inch

1. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) MF-180-36 (Flat) and MFEX 180—36
2. Pexco LLC, Flexi-Guide Models FG300PE, FG300UR, and FG300EFX
3. Carsonite, "Super Duck" (Round SDR-336)
4. Carsonite, Model SDCF03601MB "Channelizer"
5. FlexStake, Models 703, 753 TM, and EB3

6. GreenLine, Model SMD-36
7. Hi-way Safety, Inc. "Channel Guide Channelizer" Model CGC36
8. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
9. Safe-Hit, Guide Post, Model SH236SMA and Dura-Post, Model SHL36SMA
10. Three D Traffic Works "Boomerang" 5200 Series
11. Flexible Marker Support, Flexistiff Model C-9484-36
12. Shur-Tite Products, Shur-Flex

Lane Separation System

1. Pexco LLC, "Flexi-Guide (FG) 300 Curb System"
2. Qwick Kurb, "Klemmfix Guide System"
3. Dura-Curb System
4. Tuff Curb
5. FG 300 Turnpike Curb
6. Shur-Tite Products, SHUR-Curb , Model No. SF0200

CONICAL DELINEATORS, 42-inch

(For 28-inch Traffic Cones, see Standard Specifications)

1. Bent Manufacturing Company "T-Top", TDSC Series
2. Plastic Safety Systems "Navigator-42"
3. TrafFix Devices "Grabber"
4. Three D Traffic Works "Ringtop" TD7000, ID No. 742143
5. Three D Traffic Works, TD7500
6. Work Area Protection Corp. C-42
7. Custom-Pak 4600 (Part No. 93005-0001)
8. Plasticade, Navicade, 650 RI

OBJECT MARKERS

Type "K", 18-inch

1. Pexco LLC, Model FG318PE
2. Carsonite, Model SMD 615
3. FlexStake, Model 701 KM
4. Safe-Hit, Model SH718SMA
5. Impact Recover Systems, Model 282-K

Type "Q" Object Markers, 24-inch

1. Bent Manufacturing "Masterflex" Model MF-360-24
2. Pexco LLC, Model FG324PE
3. Carsonite, "Channelizer"
4. FlexStake, Model 701KM
5. Safe-Hit, Models SH824SMA_WA and SH824GP3_WA
6. Three D Traffic Works ID No. 531702W and TD 5200
7. Three D Traffic Works ID No. 520896W
8. Safe-Hit, Dura-Post SHLQ-24"
9. Flexible Marker Support, IMC 9484-24
10. Impact Recover Systems, Model 282-Q

CONCRETE BARRIER MARKERS AND
TEMPORARY RAILING (TYPE K) REFLECTORS

Impactable Type

1. ARTUK, "FB"
2. Pexco LLC, Models PCBM-12 and PCBM-T12, PCBM 912
3. Duraflex Corp., "Flexx 2020" and "Electriflexx"
4. Hi-Way Safety, Inc., Model GMKRM100
5. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
6. Three D Traffic Works "Roadguide" Model TD 9300

Non-Impactable Type

1. ARTUK, JD Series
2. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
3. Vega Molded Products, Models GBM and JD
4. Plastic Vacuum Forming, "Cap-It C400"

METAL BEAM GUARD RAIL POST MARKERS

(For use to the left of traffic)

1. Pexco LLC, "Mini" (3" x 10"), I-Flex
2. Creative Building Products, "Dura-Bull, Model 11201"
3. Duraflex Corp., "Railrider"
4. Plastic Vacuum Forming, "Cap-It C300"

CONCRETE BARRIER DELINEATORS, 16-inch

(For use to the right of traffic)

1. Pexco LLC, Model PCBM T-16
2. Safe-Hit, Model SH216RBM
3. Three D Traffic Works "Roadguide" Model 9400

CONCRETE BARRIER-MOUNTED MINI-DRUM (10" x 14" x 22")

1. Stinson Equipment Company "SaddleMarker"

GUARD RAILING DELINEATOR

(Place top of reflective element at 48 inches above plane of roadway)

Wood Post Type, 27-inch

1. Pexco LLC, FG 427 and FG 527
2. Carsonite, Model 427
3. FlexStake, Model 102 GR
4. GreenLine GRD 27
5. Safe-Hit, Model SH227GRD
6. Three D Traffic Works "Guardflex" TD9100
7. New Directions Mfg, NDM27
8. Shur-Tite Products, Shur-Tite Flat Mount
9. Glasforms, Hiway-Flex, GR-27-00
10. Impact Recover Systems, 200-GRP

Barrier, Guardrail Visibility Enhancement

1. UltraGuard Safety System, Potters Industries, Inc.
2. Worldwide Safety and Irwin Hodson, Monarch Butterfly Reflective Device (MBGR only)

Steel Post Type

1. Carsonite, Model CFGR-327

RETROREFLECTIVE SHEETING

Channelizers, Barrier Markers, and Delineators

1. Avery Dennison T-6500 Series (For rigid substrate devices only)
2. Avery Dennison WR-7100 Series and WR-6100
3. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
4. Reflexite, PC-1000 Metalized Polycarbonate
5. Reflexite, AC-1000 Acrylic
6. Reflexite, AP-1000 Metalized Polyester
7. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
8. 3M, High Intensity

Traffic Cones, 4-inch and 6-inch Sleeves

1. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
2. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight", C85
3. 3M Series 3840, Series 3340
4. Avery Dennison S-9000C

Drums

1. Avery Dennison WR-6100 Series
2. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
3. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
4. 3M Series 3810

BARRICADE SHEETING

Type I, Medium-Intensity (Typically Enclosed Lens, Glass-Bead Element)

1. Nippon Carbide Industries, CN8117
2. Avery Dennison, W 1100 series
3. 3M Series CW 44

Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

1. Avery Dennison, W-2100 Series

Type IV, High Intensity (Typically Unmetalized Microprismatic Retroreflective Element)

1. 3M Series 3334/3336

Vertical Clearance Signs: Structure Mounted

1. 3M Model 4061, Diamond Grade DG3, Fluorescent Yellow

Signs: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

1. Avery Dennison, T-2500 Series
2. Nippon Carbide Industries, Nikkalite 18000

Signs: Type III, High-Intensity (Typically Encapsulated Glass-Bead Element)

1. Avery Dennison, T-5500A and T-6500 Series
2. Nippon Carbide Industries, Nikkalite Brand Ultralite Grade II
3. 3M 3870 and 3930 Series
4. Changzhou Hua R Sheng, Series TM 1200
5. Oracal, Oralite Series 5800

Signs: Type IV, High-Intensity (Typically Unmetallized Microprismatic Element)

1. Avery Dennison, T-6500 Series
2. Nippon Carbide Industries, Crystal Grade, 94000 Series
3. Nippon Carbide Industries, Model No. 94847 Fluorescent Orange
4. 3M Series 3930 and Series 3924S

Signs: Type VI, Elastomeric (Roll-Up) High-Intensity, without Adhesive

1. Avery Dennison, WU-6014
2. Novabrite LLC, "Econobrite"
3. Reflexite "Vinyl"
4. Reflexite "SuperBright"
5. Reflexite "Marathon"
6. 3M Series RS20

Signs: Type VIII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

1. Avery Dennison, T-7500 Series
2. Avery Dennison, T-7511 Fluorescent Yellow
3. Avery Dennison, T-7513 Fluorescent Yellow Green

4. Avery Dennison, W-7514 Fluorescent Orange
5. Nippon Carbide Industries, Nikkalite Crystal Grade Series 92800
6. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92847 Fluorescent Orange

Signs: Type IX, Very-High-Intensity (Typically Unmetallized Microprismatic Element)

1. 3M VIP Series 3981 Diamond Grade Fluorescent Yellow
2. 3M VIP Series 3983 Diamond Grade Fluorescent Yellow/Green
3. 3M VIP Series 3990 Diamond Grade
4. Avery Dennison T-9500 Series
5. Avery Dennison, T9513, Fluorescent Yellow Green
6. Avery Dennison, W9514, Fluorescent Orange
7. Avery Dennison, T-9511 Fluorescent Yellow

Signs: Type XI, Very High Intensity (Typically Unmetallized Microprismatic Element)

1 3M Diamond Grade, DG3, Series 4000
2. 3M Diamond Grade, DG3, Series 4081, Fluorescent Yellow
3. 3M Diamond Grade, DG3, Series 4083, Fluorescent Yellow/Green
4. 3M Diamond Grade, DG3, Series 4084, Fluorescent Orange
5. Avery Dennison, OmniCube, T-11500 Series
6. Avery Dennison, OmniCube, T-11511, Fluorescent Yellow
7. Avery Dennison, OmniCube, T-11513, Fluorescent Yellow Green
8. Avery Dennison, OmniCube, W-11514 Fluorescent Orange

SPECIALTY SIGNS

1. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

ALTERNATIVE SIGN SUBSTRATES

Fiberglass Reinforced Plastic (FRP) and Expanded Foam PVC

1. Fiber-Brite (FRP)
2. Sequentia, "Polyplate" (FRP)
3. Inteplast Group "InteCel" (0.5 inch for Post-Mounted CZ Signs, 48-inch or less)(PVC)

Aluminum Composite, Temporary Construction Signs and Permanent Signs up to 4 foot, 7 Inches

1. Alcan Composites "Dibond Material, 80 mils"
2. Mitsubishi Chemical America, Alpolic 350
3. Bone Safety Signs, Bone Light ACM (temporary construction signs only)
4. Kommerling, USA, KomAlu 3 mm

8-1.02 STATE-FURNISHED MATERIALS

The State furnishes you with:

Laminated wood box posts with metal caps for roadside signs
Padlock
Survey marker disk

8-1.03 SLAG AGGREGATE

Air-cooled iron blast furnace slag shall not be used to produce aggregate for:

1. Structure backfill material.
2. Pervious backfill material.
3. Permeable material.
4. Reinforced or prestressed portland cement concrete component or structure.

Aggregate produced from slag resulting from a steel-making process shall not be used for a highway construction project except for the following items:

1. Imported Borrow.
2. Aggregate Subbase.
3. Class 2 Aggregate Base.
4. Hot Mix Asphalt.

Steel slag to be used to produce aggregate for aggregate subbase and Class 2 aggregate base shall be crushed so that 100 percent of the material will pass a 3/4-inch sieve and then shall be control aged for a period of at least 3 months under conditions that will maintain all portions of the stockpiled material at a moisture content in excess of 6 percent of the dry weight of the aggregate.

A supplier of steel slag aggregate shall provide separate stockpiles for controlled aging of the slag. An individual stockpile shall contain not less than 10,000 tons nor more than 50,000 tons of slag. The material in each individual stockpile shall be assigned a unique lot number and each stockpile shall be identified with a permanent system of signs. The supplier shall maintain a permanent record of the dates on which stockpiles are completed and controlled aging begun, of the dates when controlled aging was completed, and of the dates tests were made and the results of these tests. Moisture tests shall be made at least once each week. No credit for aging will be given for the time period covered by tests which show a moisture content of 6 percent or less. The stockpiles and records shall be available to the Engineer during normal working hours for inspection, check testing and review.

The supplier shall notify the Transportation Laboratory when each stockpile is completed and controlled aging begun. No more aggregate shall be added to the stockpile unless a new aging period is initiated. A further notification shall be sent when controlled aging is completed.

The supplier shall provide a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Each stockpile or portion of a stockpile that is used in the work will be considered a lot. The Certificates of Compliance shall state that the steel slag aggregate has been aged in a stockpile for at least 3 months at a moisture content in excess of 6 percent of the dry weight of the aggregate.

Steel slag used for imported borrow shall be weathered for at least 3 months. Prior to the use of steel slag as imported borrow, the supplier shall furnish a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall state that the steel slag has been weathered for at least 3 months.

Each delivery of aggregate containing steel slag for use as aggregate subbase or Class 2 aggregate base shall be accompanied by a delivery tag for each load which will identify the lot of material by stockpile number, where the slag was aged, and the date that the stockpile was completed and controlled aging begun.

Air-cooled iron blast furnace slag or natural aggregate may be blended in proper combinations with steel slag aggregate to produce the specified gradings, for those items for which steel slag aggregate is permitted, unless otherwise provided.

Aggregate containing slag shall meet the applicable quality requirements for the items in which the aggregate is used.

The combined slag aggregate shall conform to the specified grading for the item in which it is used. The grading will be determined by California Test 202, modified by California Test 105 when there is a difference in specific gravity of 0.2 or more between the coarse and fine portion of the aggregate or between blends of different aggregates.

No aggregate produced from slag shall be placed within one foot, measured in any direction, of a non-cathodically protected pipe or structure unless the aggregate is incorporated in portland cement concrete pavement, in hot mix asphalt, or in treated base.

When slag is used as aggregate in hot mix asphalt, the K_c factor requirements, as determined by California Test 303, will not apply.

If steel slag aggregates are used to make hot mix asphalt, there shall be no other aggregates used in the mixture, except that up to 50 percent of the material passing the No. 4 sieve may consist of iron blast furnace slag aggregates or natural aggregates, or a combination thereof. If iron blast furnace aggregates or natural aggregates or a combination thereof are used in the mix, each type of aggregate shall be fed to the drier at a uniform rate. The rate of feed of each type of aggregate shall be maintained within 10 percent of the amount set. Adequate means shall be provided for controlling and checking the accuracy of the feeder.

Steel slag aggregate shall be stored separately from iron blast furnace slag aggregate and each type of slag aggregate shall also be stored separately from natural aggregate.

Hot mix asphalt produced from more than one of the following shall not be placed in the same layer: steel slag aggregates, iron blast furnace slag aggregates, natural aggregates or any combination thereof. Once a type of aggregate or aggregates is selected, it shall not be changed without prior approval by the Engineer.

If steel slag aggregates are used to produce hot mix asphalt, and if the specific gravity of a compacted stabilometer test specimen is in excess of 2.40, the quantity of hot mix asphalt to be paid for will be reduced. The stabilometer test specimen will be fabricated in conformance with the procedures in California Test 304 and the specific gravity of the specimen will be determined in conformance with Method C of California Test 308. The pay quantity of hot mix asphalt will be determined by multiplying the quantity of hot mix asphalt placed in the work by 2.40 and dividing the result by the specific gravity of the compacted stabilometer test specimen. Such reduction in quantity will be determined and applied as often as is necessary to ensure accurate results as determined by the Engineer.

SECTION 8-2. CONCRETE

8-2.01 FREEZING CONDITION REQUIREMENTS

GENERAL

The mortar strength of fine aggregate relative to the mortar strength of Ottawa sand shall be a minimum of 100 percent as determined by California Test 515.

Portland cement concrete shall contain not less than 590 pounds of cementitious material per cubic yard unless a higher cementitious material content is specified in these special provisions.

An air-entraining admixture conforming to the provisions in Section 90-4, "Admixtures," of the Standard Specifications shall be added to the concrete at the rate required to result in an air content of 6.0 ± 1.5 percent in the freshly mixed concrete, unless a different air content is specified in these special provisions. Air-entraining admixture is not required in concrete placed at least 2 feet below the adjacent undisturbed grade or at least 3 feet below compacted finished grade, if the concrete will not experience freezing conditions during construction. Air-entraining admixture is not required in rapid strength concrete that does not contain portland cement.

CONCRETE NEAR DEICING CHEMICALS

The equations in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications, shall not apply to cementitious material for concrete at barrier rails, deck slabs and spans of bridges, concrete pavement surfaces, and sidewalks and other minor structures adjacent to the traveled way between PM 177.3 and PM 181.1. The cementitious material for this concrete shall be composed of any combination of portland cement and at least one SCM, satisfying Equation (1):

Equation (1)

$$\frac{(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)}{TC} \geq X$$

SCMs for use in this concrete shall satisfy the following equations:

Equation (2)

$$\frac{4 \times (FA + FB)}{TC} \leq 1.0$$

Equation (3)

$$\frac{(10 \times UF)}{TC} \leq 1.0$$

Equation (4)

$$\frac{2 \times (UF + FA + FB + SL)}{TC} \leq 1.0$$

Where:

UF = Silica fume, metakaolin, or UFFA, including the amount in blended cement, pounds per cubic yard. If used, the minimum amount of UF shall be 5 percent.
FA = Fly ash or natural pozzolan conforming to the requirements in AASHTO Designation: M 295, Class F or N with a CaO content up to 10 percent, including the amount in blended cement, pounds per cubic yard. If used, the minimum amount of FA shall be 15 percent.
FB = Fly ash or natural pozzolan conforming to the requirements in AASHTO Designation: M 295, Class F or N with a CaO content greater than 10 percent and up to 15 percent, including the amount in blended cement, pounds per cubic yard. If used, the minimum amount of FB shall be 15 percent.
SL = GGBFS, including the amount in blended cement, pounds per cubic yard.
TC = Total amount of cementitious material used in the mix, pounds per cubic yard.
X =1.8 for innocuous aggregate, 3.0 for all other aggregate.

The concrete mix design shall satisfy the following equation:

Equation (5)

$$\frac{27 \times (TC - MC)}{MC} \leq 5.0$$

Where:

TC = Total amount of cementitious material used in the mix, pounds per cubic yard.
MC= Minimum amount of cementitious material specified, pounds per cubic yard.

CEMENTITIOUS MATERIAL

All other cementitious material for this project shall conform to Section 90, "Portland Cement Concrete," of the Standard Specifications, and the following:

$$\frac{(41 \times UF) + (19 \times F) + (11 \times SL)}{TC} \leq 7.0$$

Where:

UF = Silica fume, metakaolin, or UFFA, including the amount in blended cement, pounds per cubic yard.
F = Fly ash or natural pozzolan conforming to the requirements in AASHTO Designation: M 295, Class F or N, including the amount in blended cement, pounds per cubic yard. (equivalent to the sum of FA and FB as defined in Section 90, "Portland Cement Concrete," of the Standard Specifications.)
SL = GGBFS, including the amount in blended cement, pounds per cubic yard.
TC = Total amount of cementitious material used, pounds per cubic yard.

8-2.02 RAPID STRENGTH CONCRETE FOR STRUCTURES

GENERAL

Summary

This section includes specifications for rapid strength concrete (RSC) for structures. You may only use RSC when specified elsewhere in these special provisions.

Definitions

Opening age: The age at which the concrete will achieve the specified strength for opening to public or construction traffic.

Submittals

Mix Design

Submit the RSC mix design at least 10 days before use. If a trial slab is required, submit the RSC mix design at least 10 days before constructing the trial slab. Include the following in the submittal:

1. Compressive strength test results for prequalification of RSC at age of break, at 3 days, and at 28 days
2. Opening age
3. Proposed aggregate grading
4. Mix proportions of cementitious material, aggregate, and water
5. Types and amounts of chemical admixtures, if used
6. Range of ambient temperatures over which the mix design will achieve the required minimum compressive strength
7. Source of materials

Volumetric Proportioning

When using volumetric proportioning, submit the following:

1. Aggregate moisture test results
2. Log of production data

Certificate of Compliance

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications with each delivery of aggregate, cementitious material, and admixtures used for calibration tests. Include certified copies of the weight of each delivery.

The Certificate of Compliance must state that the source of materials used for the calibration tests is from the same source as to be used for the planned work. The Certificate of Compliance must be signed by an authorized representative.

Quality Control and Assurance

Prequalification of RSC

Prequalification of a RSC mix design includes determining the opening age and achieving the minimum specified 28-day compressive strength.

Prequalify RSC under the specifications for prequalification of concrete specified by compressive strength in Section 90-9.01, "General," of the Standard Specifications. Determine the opening age as follows:

1. Fabricate at least 5 test cylinders to be used to determine the age of break.
2. Immediately after fabrication of the 5 test cylinders, store the cylinders in a temperature medium of 70 ± 3 °F until the cylinders are tested.
3. Determine the age of break to achieve an average strength of the 5 test cylinders of not less than 1200 psi. Not more than 2 test cylinders may have a strength of less than 1150 psi.
4. The opening age is the age of break plus 1 hour.

Weighmaster Certifications

Weighmaster certificates for RSC, regardless of the proportioning method used, must include all information necessary to trace the manufacturer and manufacturer's lot number for the cement being used. When proportioned into fabric containers, the weighmaster certificates for the cement must contain the date of proportioning, location of proportioning, and actual net draft weight of the cement. When proportioned at the job site from a storage silo, the weighmaster certificates must contain the date of proportioning, location of proportioning, and the net draft weight of the cement used in the load.

MATERIALS

General

RSC must comply with one of the following:

1. Concrete made with portland cement. The concrete must comply with Section 90, "Portland Cement Concrete," of the Standard Specifications. Type III cement may be used.

2. Concrete made with any cement that complies with the definition of hydraulic cement or blended hydraulic cement in ASTM C 219. The concrete must comply with Section 90, "Portland Cement Concrete," of the Standard Specifications, except that:

2.1. Cementitious material must comply with the following:

Test Description	Test Method	Requirement
Contraction in Air	California Test 527, w/c ratio = 0.39±0.010	0.053%, max.
Mortar Expansion in Water	ASTM C 1038	0.04%, max.
Soluble Chloride*	California Test 422	0.05%, max.
Soluble Sulfate*	California Test 417	0.30%, max.
Thermal Stability	California Test 553	90%, min.
Compressive Strength @ 3 days	ASTM C 109	2500 psi

*Test is to be done on a cube specimen fabricated in conformance with the requirements in ASTM C 109, cured at least 14 days, and then pulverized so that 100% passes the No. 50 sieve.

2.2. Citric acid or borax may be used if requested in writing by the cement manufacturer and a sample is submitted to the Engineer. Chemical admixtures, if used, must be included when testing for requirements listed in the table above.

RSC must have a minimum 28-day compressive strength of 3600 psi, except that RSC placed in bridge decks must have a minimum 28-day compressive strength of 4500 psi and must comply with the shrinkage limitations as specified for bridge deck concrete in Section 90-1.01, "Description," of the Standard Specifications.

Supplementary cementitious material is not required.

Penetration requirements of Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications do not apply.

CONSTRUCTION

General

RSC may be proportioned and placed by a volumetric mixer.

Volumetric Proportioning

RSC proportioned by a volumetric mixer must comply with the requirements specified herein.

Proportion liquid admixtures under Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures," of the Standard Specifications, except proportion liquid admixtures with a meter.

Batch-mixer trucks must proportion cement, water, aggregate, and additives by volume. Aggregate feeders must be connected directly to the drive on the cement vane feeder. The cement feed rate must be tied directly to the feed rate for the aggregate and other ingredients. Only change the ratio of cement to aggregate by changing the gate opening for the aggregate feed. The drive shaft of the aggregate feeder must have a revolution counter reading to the nearest full or partial revolution of the aggregate delivery belt.

Proportion aggregate with a belt feeder operated with an adjustable cutoff gate delineated to the nearest quarter increment. The gate opening height must be readily determinable. Proportion cement by any method that complies with the accuracy tolerance specifications. Proportion water with a meter under Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

Calibrate the cutoff gate for each batch-mixer truck used and for each aggregate source. Calibrate batch-mixer trucks at 3 different aggregate gate settings that are commensurate with production needs. Perform at least 2 calibration runs for each aggregate gate.

Individual aggregate delivery rate check-runs must not deviate more than 1.0 percent from the mathematical average of all runs for the same gate and aggregate type. Each test run must be at least 1,000 pounds.

At the time of batching, dry and drain aggregates to a stable moisture content. Do not proportion aggregates with visible separation of water from the aggregate during proportioning. At the time of batching, the free moisture content of fine aggregate must not exceed 8 percent of its saturated, surface-dry weight.

If the proportioning plant has separate supplies of the same size group of aggregate with different moisture content, specific gravity, or surface characteristics affecting workability, exhaust 1 supply before using another supply.

Cover rotating and reciprocating equipment on batch-mixer trucks with metal guards.

Individual cement delivery rate check-runs must not deviate more than 1.0 percent of the mathematical average of 3 runs of at least 1,000 pounds each.

When the water meter operates between 50 percent and 100 percent of production capacity, the indicated weight of water delivered must not differ from the actual weight delivered by more than 1.5 percent for each of 2 runs of 75 gallons. Calibrate the water meter under California Test 109. The water meter must be equipped with a resettable totalizer and display the operating rate.

Conduct calibration tests for aggregate, cement, and water proportioning devices with a platform scale located at the calibration site. Platform scales for weighing test-run calibration material must have a maximum capacity of 2.75 tons with maximum graduations of 1 pound. Error test the platform scale within 8 hours of calibrating the batch-mixer truck proportioning devices. Perform error-testing with test weights under California Test 109. Furnish a witness scale that is within 2 graduations of the test weight load. The witness scale must be available for use at the production site throughout the production period. Equipment needed for the calibration of proportioning systems must remain available at the production site throughout the production period.

The batch-mixer truck must be equipped so that accuracy checks can be made. Recalibrate proportioning devices every 90 days after production begins or when you change the source or type of any ingredient.

A spot calibration is calibration of the cement proportioning system only. Perform a 2-run spot calibration each time 55 tons of cement passes through the batch-mixer truck. If the spot calibration shows the cement proportioning system does not comply with the specifications, complete a full calibration of the cement proportioning system before you resume production.

Locate cement storage immediately before the cement feeder. Equip the system with a device that automatically shuts down power to the cement feeder and aggregate belt feeder when the cement storage level is less than 20 percent of the total volume.

Determine aggregate moisture under California Test 223 at least every 2 hours during proportioning and mixing operations. Record aggregate moisture determinations and submit them at the end of each production shift.

Equip each aggregate bin with a device that automatically shuts down the power to the cement feeder and the aggregate belt feeder when the aggregate discharge rate is less than 95 percent of the scheduled discharge rate.

Proportioning device indicators must be in working order before beginning proportioning and mixing operations and must be visible when standing near the batch-mixer truck.

Identifying numbers of batch-mixer trucks must be at least 3 inches in height, and be located on the front and rear of the vehicle.

Mix volumetric proportioned RSC in a mechanically operated mixer. You may use auger-type mixers. Operate mixers uniformly at the mixing speed recommended by the manufacturer. Do not use mixers that have an accumulation of hard concrete or mortar.

Do not mix more material than will permit complete mixing. Reduce the volume of material in the mixer if complete mixing is not achieved. Continue mixing until a homogeneous mixture is produced at discharge. Do not add water to the RSC after discharge.

Do not use equipment with components made of aluminum or magnesium alloys that may have contact with plastic concrete during mixing or transporting of RSC.

The Engineer determines uniformity of concrete mixtures by differences in penetration measurements made under California Test 533. Differences in penetration are determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load. The differences must not exceed 5/8 inch. Submit samples of freshly mixed concrete. Sampling facilities must be safe, accessible, clean, and produce a sample that is representative of production. Sampling devices and sampling methods must comply with California Test 125.

Do not use ice to cool RSC directly. If ice is used to cool water used in the mix, it must be melted before entering the mixer.

Proportion and charge cement into a mixer such that there is no variance of the required quantity of cement due to wind, accumulation on equipment, or other conditions.

Each mixer must have metal plates that provide the following information:

1. Designed usage
2. Manufacturer's guaranteed mixed concrete volumetric capacity
3. Rotation speed

The device controlling the proportioning of cement, aggregate, and water must produce production data. The production data must be captured at 15-minute intervals throughout daily production. Each capture of production data represents production activity at that time and is not a summation of data. The amount of material represented by each production capture is the amount produced in the period from 7.5 minutes before to 7.5 minutes after the capture time. Submit the daily production data in electronic or printed media at the end of each production shift. Report the data including data titles in the following order:

1. Weight of cement per revolution count
2. Weight of each aggregate size per revolution count
3. Gate openings for each used aggregate size
4. Weight of water added to the concrete per revolution count
5. Moisture content of each used aggregate size
6. Individual volume of other admixtures per revolution count
7. Time of day
8. Day of week
9. Production start and stop times
10. Batch-mixer truck identification
11. Name of supplier
12. Specific type of concrete being produced
13. Source of the individual aggregate sizes
14. Source, brand, and type of cement
15. Source, brand and type of individual admixtures
16. Name and signature of operator

You may input production data by hand into a pre-printed form or it may be captured and printed by the proportioning device. Present electronic media containing recorded production data in a tab delimited format on a CD or DVD. Each capture of production data must be followed by a line-feed carriage-return with sufficient fields for the specified data.

Curing Concrete

For RSC made with a proprietary cement, the curing method must be as recommended by the manufacturer of the cement and as approved by the Engineer.

For RSC made using portland cement concrete, you must:

1. Cure the concrete using the curing compound method under Section 90-7.03, "Curing Structures," of the Standard Specifications. Fogging of the surface with water after the curing compound has been applied will not be required.
2. Repair immediately any damage to the film of the curing compound with additional compound. Do not repair damage to the curing compound after the concrete is opened to public traffic.
3. Cover the surface with an insulating layer or blanket when the ambient temperature is below 65 °F during the curing period. The insulation layer or blanket must have an R-value rating given in the table below. A heating tent may be used in lieu of or in combination with the insulating layer or blanket:

R-Value Ratings

Temperature Range During Curing Period	R-value, minimum
55 °F to 65 °F	1
45 °F to 55 °F	2
39 °F to 45 °F	3

If compressive strength tests are performed in the field showing that the concrete has achieved 1200 psi, you may open the lane to traffic at the age of break. Perform the compressive strength tests under the provisions for sampling and testing cylinders in Section 90-9.01, "General," of the Standard Specifications. The decision to use this option must be made in writing to the Engineer before beginning construction.

MEASUREMENT AND PAYMENT

If calibration of volumetric batch trucks is performed more than 100 miles from the project limits, payment for rapid strength concrete is reduced by $1,000.

8-2.03 CONTRACTOR QUALITY CONTROL (CONCRETE PAVEMENT)

In addition to the requirements in Section 40-1.03, "Quality Control and Assurance," of the Standard Specifications, provide a quality control (QC) manager.

Assign a QC manager before starting construction activities. The QC manager must be the sole individual responsible for:

1. Receiving, reviewing, and approving all correspondence, submittals, and reports before they are submitted to the Department
2. Signing QC plans
3. Implementing QC plans
4. Maintaining QC records

The QC manager must be responsible directly to you for the quality of the work, including materials and workmanship performed by you and your subcontractors.

The QC manager must be your employee or must be hired by a subcontractor providing only QC services. The QC manager must not be employed or compensated by a subcontractor or by other persons or entities hired by subcontractors who will provide other services or materials for the project.

Notify the Engineer of the name and contact information of the QC manager.

Full compensation for the QC manager is included in the contract price paid per cubic yard for the types of concrete pavement involved and no additional payment will be made therefor.

SECTION 8-3. WELDING

8-3.01 WELDING

GENERAL

Unless otherwise specified, Section 8-3, "Welding," shall apply to any welding that is specified to conform to an AWS welding code.

Requirements of the AWS welding codes shall apply unless otherwise specified in the Standard Specifications, on the plans, or in these special provisions. Wherever the abbreviation AWS is used, it shall be equivalent to the abbreviations ANSI/AWS or AASHTO/AWS.

Wherever reference is made to the following AWS welding codes in the Standard Specifications, on the plans, or in these special provisions, the year of adoption for these codes shall be as listed:

AWS Code	Year of Adoption
D1.1	2008
D1.3	2008
D1.4	2005
D1.5	2008
D1.6	2007
D1.8	2009

Flux cored welding electrodes conforming to the requirements of AWS A5.20 E6XT-4 or E7XT-4 shall not be used to perform welding for this project.

Unless otherwise specified, Clause 6.1.3 of AWS D1.1, paragraph 1 of Section 7.1.2 of AWS D1.4, and Clause 6.1.1.2 of AWS D1.5, are replaced with the following:

> The QC Inspector shall be the duly designated person who acts for and on behalf of the Contractor for inspection, testing, and quality related matters for all welding.
>
> Quality Assurance (QA) is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.
>
> The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship.
>
> When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

Inspection and approval of all joint preparations, assembly practices, joint fit-ups, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily

basis for each day welding is performed. For each inspection, including fit-up, Welding Procedure Specification (WPS) verification, and final weld inspection, the QC Inspector shall confirm and document compliance with the requirements of the AWS or other specified code criteria and the requirements of these special provisions on all welded joints before welding, during welding, and after the completion of each weld.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, QC Inspector, or NDT personnel to specified levels by retests or other means approved by the Engineer.

When joint weld details that are not prequalified to the details of Clause 3 of AWS D1.1 or to the details of Figure 2.4 or 2.5 of AWS D1.5 are proposed for use in the work, the joint details, their intended locations, and the proposed welding parameters and essential variables, shall be approved by the Engineer. The Contractor shall allow the Engineer 15 days to complete the review of the proposed joint detail locations.

In addition to the requirements of AWS D1.1, welding procedure qualifications for work welded in conformance with this code shall conform to the following:

> When a nonstandard weld joint is to be made using a combination of WPSs, a single test may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 4.5.

Upon approval of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details shall perform a qualification test plate using the WPS variables and the joint detail to be used in production. The test plate shall have the maximum thickness to be used in production and a minimum length of 18 inches. The test plate shall be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

The Engineer will witness all qualification tests for WPSs that were not previously approved by the Department.

In addition to the requirements specified in the applicable code, the period of effectiveness for a welder's or welding operator's qualification shall be a maximum of 3 years for the same weld process, welding position, and weld type. If welding will be performed without gas shielding, then qualification shall also be without gas shielding. Excluding welding of fracture critical members, a valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's or welding operator's work remains satisfactory.

The Contractor shall notify the Engineer 7 days prior to performing any procedure qualification tests. Witnessing of qualification tests by the Engineer shall not constitute approval of the intended joint locations, welding parameters, or essential variables. The Contractor shall notify the Engineer using the "Standard TL-38 Inspection Form" located at:

http://www.dot.ca.gov/hq/esc/Translab/OSM/smbforms.htm

Clause 6.14.6, "Personnel Qualification," of AWS D1.1, Section 7.8, "Personnel Qualification," of AWS D1.4, and Clause 6.1.3.4, "Personnel Qualification," of AWS D1.5 are replaced with the following:

> Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Individuals who perform NDT, review the results, and prepare the written reports shall be either:
>
> A. Certified NDT Level II technicians, or;
> B. Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians.

Clause 6.6.5, "Nonspecified NDT Other than Visual," of AWS D1.1, Section 7.6.5 of AWS D1.4 and Clause 6.6.5 of AWS D1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS or other specified welding codes, in the Standard Specifications, or in these special provisions. Except as provided for in these special provisions, additional NDT required by the Engineer, and associated repair work, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Prior to release of welded material by the Engineer, if testing by NDT methods other than those originally specified discloses an attempt to defraud or reveals a gross nonconformance, all costs associated with the repair of the deficient area, including NDT of the weld and of the repair, and any delays caused by the repair, shall

be at the Contractor's expense. A gross nonconformance is defined as the sum of planar type rejectable indications in more than 20 percent of the tested length.

When less than 100 percent of NDT is specified for any weld, it is expected that the entire length of weld meet the specified acceptance-rejection criteria. Should any welding deficiencies be discovered by additional NDT directed or performed by the Engineer that utilizes the same NDT method as that originally specified, all costs associated with the repair of the deficient area, including NDT of the weld and of the weld repair, and any delays caused by the repair, shall be at the Contractor's expense.

Repair work to correct welding deficiencies discovered by visual inspection directed or performed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

WELDING QUALITY CONTROL

Welding quality control shall conform to the requirements in the AWS or other specified welding codes, the Standard Specifications, and these special provisions.

Unless otherwise specified, welding quality control shall apply to work welded in conformance with the provisions in the following:

A. Section 49, "Piling," Section 52, "Reinforcement," Section 55, "Steel Structures," and Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications
B. "Structural Steel for Building Work" of these special provisions

Unless otherwise specified, Clauses 6.1.4.1 and 6.1.4.3 of AWS D1.1, paragragh 2 of Section 7.1.2 of AWS D1.4, and Clauses 6.1.3.2 through 6.1.3.3 of AWS D1.5 are replaced with the following:

The QC Inspector shall be currently certified as an AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors."

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors." The Assistant QC Inspector may perform inspection under the direct supervision of the QC Inspector provided the assistant is always within visible and audible range of the QC Inspector. The QC Inspector shall be responsible for signing all reports and for determining if welded materials conform to workmanship and acceptance criteria. The ratio of QC Assistants to QC Inspectors shall not exceed 5 to 1.

The Contractor shall designate in writing a welding Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for the quality of welding, including materials and workmanship, performed by the Contractor and subcontractors.

The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, reviewing, and approving all correspondence, required submittals, and reports to and from the Engineer. The QCM shall be a registered professional engineer or shall be currently certified as a CWI.

Unless the QCM is hired by a subcontractor providing only QC services, the QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

The QCM shall sign and furnish to the Engineer, a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each item of work for which welding was performed. The certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in conformance with the details shown on the plans, the Standard Specifications, and these special provisions.

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project, except for the following conditions:

A. The work is welded in conformance with AWS D1.5 and is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program, Category CBR, Major Steel Bridges and Fracture Critical endorsement F, when applicable.
B. Structural steel for building work is welded in conformance with AWS D1.1 and is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program, Category STD, Standard for Steel Building Structures.

For welding performed at such facilities, the inspection personnel or NDT firms may be employed or compensated by the facility performing the welding provided the facility maintains a QC program that is independent from production.

Unless otherwise specified, an approved independent third party will witness the qualification tests for welders or welding operators. The independent third party shall be a current CWI and shall not be an employee of the contractor performing the welding. The Contractor shall allow the Engineer 15 days to review the qualifications and copy of the current certification of the independent third party.

Prior to submitting the Welding Quality Control Plan (WQCP) required herein, a prewelding meeting between the Engineer, the Contractor's QCM, and a representative from each entity performing welding or inspection for this project, shall be held to discuss the requirements for the WQCP.

Information regarding the contents, format, and organization of a WQCP, is available at the Transportation Laboratory and at:

http://www.dot.ca.gov/hq/esc/Translab/OSM/smbresources.htm

The Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 2 copies of a separate WQCP for each subcontractor or supplier for each item of work for which welding is to be performed.

The Contractor shall allow the Engineer 15 days to review the WQCP submittal after a complete plan has been received. No welding shall be performed until the WQCP is approved in writing by the Engineer.

An amended WQCP or any addendum to the approved WQCP shall be submitted to, and approved in writing by the Engineer, for proposed revisions to the approved WQCP. An amended WQCP or addendum will be required for revisions to the WQCP, including but not limited to a revised WPS; additional welders; changes in NDT firms, QC, or NDT personnel or procedures; or updated systems for tracking and identifying welds. The Engineer shall have 7 days to complete the review of the amended WQCP or addendum. Work affected by the proposed revisions shall not be performed until the amended WQCP or addendum has been approved.

After final approval of the WQCP, amended WQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of the approved documents. A copy of the Engineer approved document shall be available at each location where welding is to be performed.

All welding will require inspection by the Engineer. The Contractor shall request inspection at least 3 business days prior to the beginning of welding for locations within California and 5 business days for locations outside of California. The Contractor shall request inspection at:

http://www.dot.ca.gov/hq/esc/Translab/OSM/smbforms.htm

Continuous inspection shall be provided when any welding is being performed. Continuous inspection, as a minimum, shall include having a QC Inspector within such close proximity of all welders or welding operators so that inspections by the QC Inspector of each welding operation at each welding location does not lapse for a period exceeding 30 minutes.

A daily production log for welding shall be kept for each day that welding is performed. The log shall clearly indicate the locations of all welding. The log shall include the welders' names, amount of welding performed, any problems or deficiencies discovered, and any testing or repair work performed, at each location. The daily report from each QC Inspector shall also be included in the log.

The following items shall be included in a Welding Report that is to be submitted to the Engineer within 15 days following the performance of any welding:

A. A daily production log.
B. Reports of all visual weld inspections and NDT.
C. Radiographs and radiographic reports, and other required NDT reports.
D. A summary of welding and NDT activities that occurred during the reporting period.
E. Reports of each application of heat straightening.
F. A summarized log listing the rejected lengths of weld by welder, position, process, joint configuration, and piece number.
G. Documentation that the Contractor has evaluated all radiographs and other nondestructive tests and corrected all rejectable deficiencies, and that all repaired welds have been reexamined using the required NDT and found acceptable.

The following information shall be clearly written on the outside of radiographic envelopes: name of the QCM, name of the nondestructive testing firm, name of the radiographer, date, contract number, complete part description,

and all included weld numbers, report numbers, and station markers or views, as detailed in the WQCP. In addition, all interleaves shall have clearly written on them the part description and all included weld numbers and station markers or views, as detailed in the WQCP. A maximum of 2 pieces of film shall be used for each interleave.

Reports of all visual inspections and NDT shall be signed by the inspector or technician and submitted daily to the QCM for review and signature prior to submittal to the Engineer. Corresponding names shall be clearly printed or typewritten next to all signatures. Reports of all NDT, whether specified, additional, or informational, performed by the Contractor shall be submitted to the Engineer.

The Engineer will review the Welding Report to determine if the Contractor is in conformance with the WQCP. Except for field welded steel pipe piling, the Engineer shall be allowed 15 days to review the report and respond in writing after the complete Welding Report has been received. Prior to receiving notification from the Engineer of the Contractor's conformance with the WQCP, the Contractor may encase in concrete or cover welds for which the Welding Report has been submitted. However, should the Contractor elect to encase or cover those welds prior to receiving notification from the Engineer, it is expressly understood that the Contractor shall not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection.

For field welded steel pipe piling, including bar reinforcement in the piling, the Contractor shall allow the Engineer 2 business days to review the Welding Report and respond in writing after the required items have been received. No field welded steel pipe piling shall be installed, and no reinforcement in the piling shall be encased in concrete until the Engineer has approved the above requirements in writing.

In addition to the requirements in AWS D1.1 and AWS D1.5, third-time excavations of welds or base metal to repair unacceptable discontinuities, regardless of NDT method, and all repairs of cracks require prior approval of the Engineer.

The Engineer shall be notified immediately in writing when welding problems, deficiencies, base metal repairs, or any other type of repairs not submitted in the WQCP are discovered, and also of the proposed repair procedures to correct them. For requests to perform third-time excavations or repairs of cracks, the Contractor shall include an engineering evaluation of the proposed repair. The engineering evaluation, at a minimum, shall address the following:

A. What is causing each defect?
B. Why the repair will not degrade the material properties?
C. What steps are being taken to prevent similar defects from happening again?

The Contractor shall allow the Engineer 7 days to review these procedures. No remedial work shall begin until the repair procedures are approved in writing by the Engineer.

Clause 6.5.4 of AWS D1.5 is replaced with the following:

> The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, joint fit-up, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved Welding Procedure Specification (WPS) are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Clauses 3 and 6.26. The size and contour of all welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities shall be aided by strong light, magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

In addition to the requirements of AWS D1.5, Clause 5.12 or 5.13, welding procedures qualification for work welded in conformance with that code shall conform to the following requirements:

A. Unless considered prequalified, fillet welds shall be qualified in each position. The fillet weld soundness test shall be conducted using the essential variables of the WPS as established by the Procedure Qualification Record (PQR).
B. For qualification of joints that do not conform to Figures 2.4 and 2.5 of AWS D1.5, a minimum of 2 WPS qualification tests are required. The tests shall be conducted using both Figure 5.1 and Figure 5.3. The test conforming to Figure 5.1 shall be conducted in conformance with AWS D1.5, Clause 5.12 or 5.13. The test conforming to Figure 5.3 shall be conducted using the welding electrical parameters that were established for the test conducted conforming to Figure 5.1. The ranges of welding electrical parameters established during welding per Figure 5.1 in conformance with AWS D1.5, Clause 5.12, shall be further restricted according to the limits in Table 5.3 during welding per Figure 5.3.

C. Multiple zones within a weld joint may be qualified. The travel speed, amperage, and voltage values that are used for tests conducted per AWS D1.5 Clause 5.13 shall be consistent for each pass in a weld joint, and shall in no case vary by more than ±10 percent for travel speed, ±10 percent for amperage, and ±7 percent for voltage as measured from a predetermined target value or average within each weld pass or zone. The travel speed shall in no case vary by more than ±15 percent when using submerged arc welding.
D. For a WPS qualified in conformance with AWS D1.5 Clause 5.13, the values to be used for calculating ranges for current and voltage shall be based on the average of all weld passes made in the test. Heat input shall be calculated using the average of current and voltage of all weld passes made in the test for a WPS qualified in conformance with Clause 5.12 or 5.13.
E. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Clause 5.19.3.
F. When a nonstandard weld joint is to be made using a combination of WPSs, a test conforming to Figure 5.3 may be conducted combining the WPSs to be used in production, provided the essential variables, including weld bead placement, of each process are limited to those established in Table 5.3.
G. Prior to preparing mechanical test specimens, the PQR welds shall be inspected by visual and radiographic tests. Backing bar shall be 3 inches in width and shall remain in place during NDT testing. Results of the visual and radiographic tests shall comply with AWS D1.5 Clause 6.26.2, excluding Clause 6.26.2.2. Test plates that do not comply with both tests shall not be used.

WELDING FOR OVERHEAD SIGN AND POLE STRUCTURES

The Contractor shall meet the following requirements for any work welded in conformance with the provisions in Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

Welding inspection personnel or NDT firms to be used in the work shall not be employed or compensated by any subcontractor or by other persons or entities hired by subcontractors who will provide other services or materials for the project except for when the welding is performed at a permanent fabrication or manufacturing facility that is certified under the AISC Quality Certification Program.

Welding Qualification Audit

Contractors or subcontractors performing welding operations for overhead sign and pole structures shall have successfully completed the Department's "Manufacturing Qualification Audit for Overhead Sign and Pole Structures." Copies of the audit form and procedures for requesting and completing the audit are available at:

http://www.dot.ca.gov/hq/esc/Translab/OSM/smbresources.htm

An audit that was approved by the Engineer no more than 3 years prior to the award of the contract will be acceptable for the entire period of this contract provided the Engineer determines the audit was for the same type of work that is to be performed on this contract.

A list of facilities that have successfully completed the audit and are authorized to provide material for this contract is available at:

http://www.dot.ca.gov/hq/esc/Translab/OSM/smdocuments/Internet_auditlisting.pdf

Successful completion of an audit shall not relieve the Contractor of the responsibility for furnishing materials or producing finished work of the quality specified in these special provisions and as shown on the plans.

Welding Report

For work welded in conformance with the provisions in Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, a Welding Report shall be submitted in conformance with the provisions in "Welding Quality Control" of these special provisions.

PAYMENT

Full compensation for conforming to the requirements of "Welding" shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

SECTION 9. DESCRIPTION OF BRIDGE WORK

The bridge work to be done consists, in general, of constructing the following:

IVANPAH DITCH (AIF TRUCK)
(Bridge No. 54-1216J)

A four span cast-in-place reinforced concrete slab bridge.

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.00 CONSTRUCTION PROJECT INFORMATION SIGNS

Before any major physical construction work readily visible to highway users is started on this contract, the Contractor shall furnish and erect 1 Type 2 Construction Project Information signs at the locations designated by the Engineer.

The signs and overlays shall be of a type and material consistent with the estimated time of completion of the project and shall conform to the details shown on the plans.

The sign letters, the border and the Department's construction logos shall conform to the colors (non-reflective) and details shown on the plans, and shall be on a white background (non-reflective). The colors blue and orange shall conform to PR Color Number 3 and Number 6, respectively, as specified in the Federal Highway Administration's Color Tolerance Chart.

The sign message to be used for fund types shall consist of the following, in the order shown:

FEDERAL HIGHWAY TRUST FUNDS
STATE HIGHWAY FUNDS

The sign message to be used for type of work shall consist of the following:

ROADSIDE WORK

The sign message to be used for the Year of Completion of Project Construction will be furnished by the Engineer. The Contractor shall furnish and install the "Year" sign overlay within 10 working days of notification of the year date to be used.

The letter sizes to be used shall be as shown on the plans. The information shown on the signs shall be limited to that shown on the plans.

The signs shall be kept clean and in good repair by the Contractor.

Upon completion of the work, the signs shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the construction project information signs shall be considered as included in the contract lump sum price paid for construction area signs and no additional compensation will be allowed therefor.

10-1.01 ORDER OF WORK

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

The Contractor shall complete landscape crossover irrigation work prior to beginning paving operations.

Attention is directed to "Fence (Type Desert Tortoise) (Type 1)," "Desert Tortoise Protection," and "Type BW Fence" of these special provisions regarding the protection of established habitat areas of endangered species prior to beginning construction work.

Attention is directed to "Storm Water Pollution Prevention Plan (SWPPP)," "Temporary Concrete Washouts," "Temporary Construction Entrance," "Temporary Cover," and "Street Sweeping" of these special provisions and detention basin shown in the plans regarding the early construction of temporary and/or permanent water pollution control practices.

The Contractor shall notify the Engineer at least five weeks in advance prior to beginning construction work that will require the removal of freeway call boxes so that a fax notice can be sent to the local Service Authority for Freeways and Expressways (SAFE) requesting its removal.

Tree well grate frames shall be installed prior to pouring Portland cement concrete sidewalks. Duff shall be removed and stockpiled prior to earthwork operations as specified under "Duff," of these special provisions.

The first order of work shall be to place the order for the electrical equipment. The Engineer shall be furnished a statement from the vendor that the order for the electrical equipment has been received and accepted by the vendor.

The uppermost layer of new pavement shall not be placed until all underlying conduits and loop detectors have been installed.

Attention is directed to "Maintaining Traffic" and "Temporary Pavement Delineation" of these special provisions and to the stage construction sheets of the plans.

The work shall be performed in conformance with the stages of construction shown on the plans. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

In each stage, after completion of the preceding stage, the first order of work shall be the removal of existing pavement delineation as directed by the Engineer. Pavement delineation removal shall be coordinated with new delineation so that lane lines are provided at all times on traveled ways open to public traffic.

Before obliterating any pavement delineation (traffic stripes, pavement markings, and pavement markers) that is to be replaced on the same alignment and location, as determined by the Engineer, the pavement delineation shall be referenced by the Contractor, with a sufficient number of control points to reestablish the alignment and location of the new pavement delineation. The references shall include the limits or changes in striping pattern, including one- and 2-way barrier lines, limit lines, crosswalks and other pavement markings. Full compensation for referencing existing pavement delineation shall be considered as included in the contract prices paid for new pavement delineation and no additional compensation will be allowed therefor.

Prior to applying hot mix asphalt (Type C), the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the hot mix asphalt (Type C) has been placed. After completion of the hot mix asphalt (Type C) operation, all covers shall be removed and disposed of in a manner satisfactory to the Engineer. Full compensation for covering manholes, valve and monument covers, grates, or other exposed facilities, referencing, and removing temporary cover shall be considered as included in the contract price paid per ton for hot mix asphalt (Type C), and no additional compensation will be allowed therefor.

At those locations exposed to public traffic where guard railings or barriers are to be constructed, reconstructed, or removed and replaced, the Contractor shall schedule operations so that at the end of each working day there shall be no post holes open nor shall there be any railing or barrier posts installed without the blocks and rail elements assembled and mounted thereon.

At least 60 days before planting the plants, furnish the Engineer a statement from the vendor that the order for the plants required for this contract, including inspection plants, has been received and accepted by the vendor. The statement from the vendor must include the names, sizes, and quantities of plants ordered and the anticipated date of delivery.

Place orders for replacement plants with the vendor at the appropriate time so that the roots of the replacement plants are not in a root-bound condition.

Unless otherwise shown on the plans or specified in these special provisions, conduits to be jacked or drilled or installed by the open trench method for water line crossovers and sprinkler control crossovers must be installed before the installation of other pipe supply lines.

Submittal of working drawings for electrical components must comply with Section 20-5.027B, "Wiring Plans and Diagrams," of the Standard Specifications.

Preinstall irrigation components in the irrigation controller enclosure cabinet before field installation as specified under "Irrigation Controller Enclosure Cabinet" of these special provisions.

10-1.02 CONTRACTOR SUPPLIED BIOLOGIST

GENERAL

Summary

This work includes providing a Contractor supplied biologist to monitor construction and other activities to protect regulated species that may be harmed during construction activities.

Submittals

Qualifications: Within 7 days after contract approval, submit each biologist's name, resume, and statement of qualifications to the Engineer. Allow 15 days for the Engineer's review. If the submittal is incomplete, the Engineer will provide comments. Within 7 days after receiving the Engineer's comments, update and re-submit qualifications data. Do not start construction activities until the Contractor Supplied Biologist is authorized by the Engineer.

Protocols: Protocols for species protection surveys must be submitted for acceptance within 30 days before beginning survey activities.

Pre-Construction Survey Report: Submit a Pre-Construction Survey Report within 14 days before beginning construction activities.

Initial Monitoring Report: Submit an Initial Monitoring Report within 24 hours after commencement of ground-disturbing activities that includes, at a minimum, the requirements for Monitoring Report submittals.

Monitoring Report: Submit a Monitoring Report every 30 working days during the monitoring period.

Incident Report: Submit an Incident Report within 48 hours of the incident.

Annual Monitoring Report: Submit no later than January 31 during each year of construction.

Final Monitoring Report: Submit no later than 45 days after completion of the project.

Qualifications:

A biologist must meet PLAC requirements and provide required qualifications to the Engineer for transmittal to regulatory agencies. All project specific authorizations must be current and valid for the duration of this project.

Protocols

Use protocols required in PLACs.

CONSTRUCTION

Pre-Construction Survey

Survey the work area for regulated species within 14 days before beginning construction activities.

Monitoring Schedule

Monitoring must comply with the schedule in Species Protection.

Monitoring Duties

The biologist must:

- Monitor for regulated species within the project area.
- Assure that construction activities do not result in take of regulated species.
- Assure that construction activities comply with PLACs.
- Immediately notify the Engineer of any take of regulated species.
- Prepare, submit, and sign notifications and reports.

Notification and Reporting

All reports must include:

- PLAC requirement implementation
- Name(s) of the biologist(s) conducting biological activity
- Date(s) and time(s) of monitoring
- Locations and activities monitored
- Representative photographs
- Findings
- When regulated species are observed, reports must recommend actions to protect the regulated species

- Name of the biologist who prepared the report
- Signature of the biologist certifying the accuracy of the report

The Pre-Construction Survey Report includes:

- Detailed observations and locations where regulated species were observed or statement that no regulated species were observed by each biologist

The incident report includes:

- Description of any take incident
- Species name and number taken
- Details of required notifications with contact information
- Corrective actions proposed or taken
- Disposition of taken species

The Annual Monitoring Report includes:

- Construction beginning and ending dates
- Identification of project impacts on the species covered in the plan
- Species protection measures with protection measure implementation details
- Incidental take details, including species name, number taken, people contacted, contact information, and disposition of taken species
- An assessment of the effectiveness of the species protection measures to mitigate Project impacts
- Recommendations to improve efficiency of protection measures to mitigate impacts to regulated species

The Final Monitoring Report must be a cumulative report following the format of the Annual Monitoring Report.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for Contractor supplied Biologist includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in Contractor supplied Biologist as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.03 WATER POLLUTION CONTROL

GENERAL

Summary

This work includes developing and implementing a storm water pollution prevention plan (SWPPP).

This project is risk level 1.

Discharges of stormwater from the project must comply with National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ, NPDES No. CAS000002) referred to herein as "Permit."

Information on forms, reports, and other documents can be found in the following Department manuals:

1. Field Guide for Construction Site Dewatering
2. Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual
3. Construction Site Best Management Practices (BMP) Manual

For the above-referenced manuals, go to the Department's Web site for the Division of Construction, Storm Water and Water Pollution Control Information, or the Department's Publication Distribution Unit.

Do not start job site activities until:

1. The SWPPP is approved.
2. The waste discharge identification number is issued.

3. SWPPP review requirements have been fulfilled. If the Regional Water Quality Control Board (RWQCB) requires time for review, allow 30 days for the review. For projects in the Lake Tahoe Hydrologic Unit and the Mammoth Lakes Hydrologic Unit, the Lahontan RWQCB will review the SWPPP.

If you operate a Contractor-support facility, protect stormwater systems and receiving waters from the discharge of potential pollutants by using water pollution control practices.

Contractor-support facilities include:

1. Staging areas
2. Storage yards for equipment and materials
3. Mobile operations
4. Batch plants for PCC and HMA
5. Crushing plants for rock and aggregate
6. Other facilities installed for your convenience, such as haul roads

Discharges from manufacturing facilities, such as batch plants and crushing plants, must comply with the general waste discharge requirements for Order No. 97-03-DWQ, NPDES General Permit No. CAS000001, issued by the State Water Resources Control Board (SWRCB) for "Discharge of Storm Water Associated with Industrial Activities Excluding Construction Activities" and referred to herein as "General Industrial Permit." For the General Industrial Permit, go to the Web site for the SWRCB.

If you operate a batch plant to manufacture PCC, HMA, or other material or a crushing plant to produce rock or aggregate, obtain coverage under the General Industrial Permit. You must be covered under the General Industrial Permit for batch plants and crushing plants located:

1. Outside of the job site
2. Within the job site that serve 1 or more contracts

If you obtain or dispose of material at a noncommercially operated borrow or disposal site, prevent water pollution due to erosion at the site during and after completion of your activities. Upon completion of your work, leave the site in a condition such that water will not collect or stand therein.

The Department does not pay for water pollution control practices at Contractor-support facilities and noncommercially operated borrow or disposal sites.

Definitions

active area: Area where soil-disturbing work activities have occurred at least once within 15 days.

construction phase: Includes (1) highway construction phase for building roads and structures, (2) plant establishment and maintenance phase for placing vegetation for final stabilization, and (3) suspension phase for suspension of work activities or winter shutdown. The construction phase continues from the start of work activities to contract acceptance.

inactive area: Area where soil-disturbing work activities have not occurred within 15 days.

normal working hours: Hours you normally work on the project.

qualifying rain event: Storm that produces at least 0.5 inch of precipitation with a 48-hour or greater period between rain events.

storm event: Storm that produces or is forecasted to produce at least 0.10 inch of precipitation within a 24-hour period.

Submittals

Storm Water Pollution Prevention Plan

General

Within 20 days of contract approval:

1. Submit 3 copies of your SWPPP for review. Allow 20 days for the Department's review. The Engineer provides comments and specifies the date when the review stopped if revisions are required.
2. Resubmit a revised SWPPP within 15 days of receiving the Engineer's comments. The Department's review resumes when a complete SWPPP has been resubmitted.
3. When the Engineer approves the SWPPP, submit an electronic copy and 4 printed copies of the approved SWPPP.

4. If the RWQCB requires review of the approved SWPPP, the Engineer submits the approved SWPPP to the RWQCB for its review and comment.
5. If the Engineer requests changes to the SWPPP based on the RWQCB's comments, amend the SWPPP within 10 days.

A qualified SWPPP developer (QSD) must develop the SWPPP.

The SWPPP must comply with the Department's Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Plan (WPCP) Preparation Manual. Include the following in the SWPPP:

1. Description of the work involved in the installation, maintenance, repair, and removal of temporary and permanent water pollution control practices.
2. Maps showing:

    2.1. Locations of disturbed soil areas
    2.2. Water bodies and conveyances
    2.3. Locations and types of water pollution control practices that will be used for each Contractor-support facility
    2.4. Locations and types of temporary water pollution control practices that will be used in the work for each construction phase
    2.5. Locations and types of water pollution control practices that will be installed permanently under the contract
    2.6. Pollutant sampling locations
    2.7. Locations planned for storage and use of potential nonvisible pollutants
    2.8. Receiving water sampling locations

3. Copy of permits obtained by the Department, including Fish & Game permits, US Army Corps of Engineers permits, RWQCB 401 certifications, aerially deposited lead variance from the Department of Toxic Substance Control, aerially deposited lead variance notification, and RWQCB waste discharge requirements for aerially deposited lead reuse.

Include the following items in the SWPPP:

1. For all projects:

    1.1. Schedule
    1.2. Construction site monitoring program (CSMP)

2. For risk level 2 projects add:

    2.1. Adherence to effluent standards for numeric action levels (NALs)
    2.2. Rain event action plan (REAP)

3. For risk level 3 projects add:

    3.1. Adherence to effluent standards for NALs and numeric effluent levels (NELs)
    3.2. REAP

Schedule

The SWPPP schedule must show when:

1. Work activities will be performed that could cause the discharge of pollutants into stormwater
2. Water pollution control practices associated with each construction phase will be implemented
3. Soil stabilization and sediment control practices for disturbed soil areas will be implemented

Construction Site Monitoring Program

A QSD must prepare the CSMP. Change the program to reflect current job site activities as needed. The CSMP must include the following:

1. For all projects:

    1.1. Visual monitoring procedures
    1.2. Sampling and analysis plan (SAP) for nonvisible pollutants
    1.3. SAP for nonstormwater discharges
    1.4. SAP for monitoring required by RWQCB

2. For risk level 2 projects add SAP for pH and turbidity
3. For risk level 3 projects add:

    3.1. SAP for pH and turbidity
    3.2. SAP for temporary active treatment systems

Sampling and Analysis Plan

Include a SAP in the CSMP.

Describe the following water quality sampling procedures in the SAP:

1. Sampling equipment
2. Sample preparation
3. Collection
4. Field measurement methods
5. Analytical methods
6. Quality assurance and quality control
7. Sample preservation and labeling
8. Collection documentation
9. Sample shipping
10. Chain of custody
11. Data management and reporting
12. Precautions from the construction site health and safety plan
13. Laboratory selection and certifications

The SAP must identify the State-certified laboratory, sample containers, preservation requirements, holding times, and analytical method. For a list of State-certified laboratories go to the CDPH Web site.

The SAP must include procedures for sample collection during precipitation.

The SAP must list conditions when you will not be required to physically collect samples such as:

1. Dangerous weather
2. Flooding or electrical storms
3. Times outside of normal working hours

Amend the SAP whenever discharges or sampling locations change because of changed work activities or knowledge of site conditions.

For a risk level 2 or risk level 3 project, include procedures in the SAP for collecting and analyzing at least 3 samples for each day of each qualifying rain event. Describe the collection of effluent samples at all locations where the stormwater is discharged off-site.

The SAP for nonvisible pollutants must describe the sampling and analysis strategy for monitoring nonvisible pollutants.

The SAP for nonvisible pollutants must identify potential nonvisible pollutants present at the job site associated with any of the following:

1. Construction materials and wastes
2. Existing contamination due to historical site usage
3. Application of soil amendments, including soil stabilization materials, with the potential to change pH or contribute toxic pollutants to stormwater

The SAP for nonvisible pollutants must include sampling procedures for the following conditions when observed during a stormwater visual inspection. Include a procedure for collecting at least 1 sample for each storm event for:

1. Materials or wastes containing potential nonvisible pollutants not stored under watertight conditions
2. Materials or wastes containing potential nonvisible pollutants stored under watertight conditions at locations where a breach, leak, malfunction, or spill occurred and was not cleaned up before the precipitation
3. Chemical applications occurring within 24 hours before precipitation or during precipitation that could discharge pollutants to surface waters or drainage systems, including fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or nonpigmented curing compound
4. Applied soil amendments, including soil stabilization materials that could change pH levels or contribute toxic pollutants to stormwater runoff and discharge pollutants to surface waters or drainage systems, unless independent test data is available to indicate acceptable concentrations of nonvisible pollutants in the material
5. Stormwater runoff from an area contaminated by historical usage of the site that could discharge pollutants to surface waters or drainage systems

The SAP for nonvisible pollutants must provide sampling procedures and a schedule for:

1. Sample collection during the first 2 hours of rain events that generate runoff
2. Sample collection during normal working hours
3. Each nonvisible pollutant source
4. Uncontaminated control sample

The SAP for nonvisible pollutants must identify locations for sampling downstream and control samples and the reasons for selecting those locations. Select locations for control samples where the sample does not come in contact with materials, wastes, or areas associated with potential nonvisible pollutants or disturbed soil areas.

Amendments

Amend and resubmit the SWPPP:

1. Annually before July 15th
2. Whenever:

    2.1. Changes in work activities could affect the discharge of pollutants
    2.2. Water pollution control practices are added by Contract Change Order
    2.3. Water pollution control practices are added at your discretion
    2.4. Changes in the quantity of disturbed soil are substantial
    2.5. Objectives for reducing or eliminating pollutants in stormwater discharges have not been achieved
    2.6. You receive a written notice of a permit violation for the project from the RWQCB or any other regulatory agency

Allow the same review time for amendments to the SWPPP as for the original SWPPP.

Training Records

Submit water pollution control training records for all employees and subcontractors who will be working at the job site. Include the training subjects, training dates, ongoing training, and tailgate meetings with your submittal. Submit records for:

1. Existing employees within 5 business days of obtaining SWPPP approval
2. New employees within 5 business days of receiving the training
3. A subcontractor's employees at least 5 business days before the subcontractor starts work

Contractor-Support Facility

At least 5 business days before operating any Contractor-support facility, submit:

1. A plan showing the location and quantity of water pollution control practices associated with the Contractor-support facility
2. A copy of the notice of intent approved by the RWQCB and the SWPPP approved by the RWQCB if you will be operating a batch plant or a crushing plant under the General Industrial Permit

Annual Certification

Submit an annual certification of compliance as described in the Department's Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Plan (WPCP) Preparation Manual before July 15th of each year.

Site Inspection Reports

The water pollution control (WPC) manager must submit the following within 24 hours of completing a weekly inspection:

1. Completed Stormwater Site Inspection Report form.
2. Best management practices (BMP) status report. The WPC manager must oversee the preparation of the report. The report must include:

    2.1. Location and quantity of installed water pollution control practices
    2.2. Location and quantity of disturbed soil for active and inactive areas

Visual Monitoring Reports

Submit a visual monitoring report for:

1. Each storm event. Include:

    1.1. Date, time, and rain gauge reading
    1.2. Visual observations:

        1.2.1. Within 2 business days before the storm for:

            1.2.1.1. Spills, leaks, and uncontrolled pollutants in drainage areas
            1.2.1.2. Proper implementation of water pollution control practices
            1.2.1.3. Leaks and adequate freeboard in storage areas

        1.2.2. Every 24 hours during the storm for:

            1.2.2.1. Effective operation of water pollution control practices
            1.2.2.2. Water pollution control practices needing maintenance and repair

        1.2.3. Within 2 business days after a qualifying rain event for:

            1.2.3.1. Stormwater discharge locations
            1.2.3.2. Evaluation of design, implementation, effectiveness, and locations of water pollution control practices including locations where additional water pollution control practices may be needed

2. Nonstormwater discharges during each of the following periods:

    2.1. January through March
    2.2. April through June
    2.3. July through September
    2.4. October through December

Use the Stormwater Site Inspection Report form to document visual monitoring. A visual monitoring report must include:

1. Name of personnel performing the inspection, inspection date, and date the inspection report is completed
2. Storm and weather conditions
3. Location of any:

    3.1. Floating and suspended material, sheen on the surface, discoloration, turbidity, odor, and source of observed pollutants for flowing and contained stormwater systems
    3.2. Nonstormwater discharges and their sources

4. Corrective action taken

Retain visual monitoring reports at the job site as part of the SWPPP.

Sampling and Analysis

Whenever sampling is required, submit a printed copy and electronic copy of water quality analysis results, and quality assurance and quality control reports within 48 hours of field sampling, and within 30 days of laboratory analysis. Electronic copies must be in one of the following formats: (1) xls, (2) .txt, (3) .cvs, (4) .dbs, or (5) .mdb. Include an evaluation of whether the downstream samples show levels of the tested parameter that are higher than the control sample. The evaluation must include:

1. Sample identification number
2. Contract number
3. Constituent
4. Reported value
5. Analytical method
6. Method detection limit
7. Reported limit

Numeric Action Level Exceedance Reports

Whenever a NAL is exceeded for a risk level 2 or risk level 3 project, notify the Engineer and submit a NAL exceedance report within 48 hours after conclusion of a storm event. The report must include:

1. Field sampling results and inspections, including:

    1.1. Analytical methods, reporting units, and detection limits
    1.2. Date, location, time of sampling, visual observations, and measurements
    1.3. Quantity of precipitation from the storm event

2. Description of BMP and corrective actions taken to manage NAL exceedance

Numeric Effluent Limit Violation Reports

Whenever a NEL is exceeded for a risk level 3 project, notify the Engineer and submit a NEL violation report within 6 hours. The report must include:

1. Field sampling results and inspections, including:

    1.1. Analytical methods, reporting units, and detection limits
    1.2. Date, location, time of sampling, visual observation and measurements
    1.3. Quantity of precipitation from the storm event

2. Description of BMP and corrective actions taken to manage NEL exceedance

Rain Event Action Plan

For a risk level 2 or risk level 3 project, submit a REAP whenever the National Weather Service is predicting a storm event with at least 50 percent probability of precipitation within 72 hours.

The WPC manager must submit the REAP at least 48 hours before a forecasted storm event.

The REAP must include:

1. Site location
2. Project risk level
3. Contact information including 24-hour emergency phone numbers for:

    3.1. WPC manager
    3.2. Erosion and sediment control providers or subcontractors
    3.3. Stormwater sampling providers or subcontractors

4. Storm information
5. Description of:

    5.1. Construction phase, including active and inactive areas
    5.2. Active work areas and activities
    5.3. Subcontractors and trades on the job site
    5.4. Prestorm activities including:

        5.4.1. Responsibilities of the WPC manager
        5.4.2. Responsibilities of the crew and crew size
        5.4.3. Stabilization practices for active and inactive disturbed soil areas
        5.4.4. Stockpile management practices
        5.4.5. Corrective actions taken for deficiencies identified during prestorm visual inspections

    5.5. Activities to be performed during storm events, including:

        5.5.1. Responsibilities of the WPC manager
        5.5.2. Responsibilities of the crew and crew size
        5.5.3. BMP for maintenance and repair

6. Flood contingency measures

Storm Water Annual Report

Submit 2 copies of a storm water annual report that covers the preceeding period from July 1st to June 30th. The report must be submitted before July 15th if construction occurs from July 1st to June 30th or within 15 days after contract acceptance if construction ends before June 30th. Allow 10 days for the Engineer's review. The Engineer provides comments and specifies the date when the review stopped if revisions are required.

Obtain approval for the format of the storm water annual report. The report must include:

1. Project information such as description and work locations
2. Stormwater monitoring information, including:

    2.1. Summary and evaluation of sampling and analysis results and laboratory reports
    2.2. Analytical methods, reporting units, and detections limits for analytical parameters
    2.3. Summary of corrective actions taken
    2.4. Identification of corrective actions taken and compliance activities not implemented
    2.5. Summary of violations
    2.6. Names of individuals performing stormwater inspections and sampling
    2.7. Logistical information for inspections and sampling, including location, date, time, and precipitation
    2.8. Visual observations and sample collection records

3. Documentation of training for individuals responsible for:

    3.1. Permit compliance
    3.2. BMP installation, inspection, maintenance, and repair
    3.3. Preparing, revising, and amending the SWPPP

Submit a revised storm water annual report within 5 business days of receiving the Engineer's comments. The Engineer's review resumes when a complete report has been resubmitted.

When the storm water annual report is approved, submit 1 electronic copy and 2 printed copies of the report signed by the WPC manager.

Information After Storm Event

Within 48 hours after the conclusion of a storm event resulting in a discharge, after a nonstormwater discharge, or after receiving a written notice or an order from the RWQCB or another regulatory agency, the WPC manager must submit the following information:

1. Date, time, location, and nature of the activity and the cause of the notice or order
2. Type and quantity of discharge
3. Water pollution control practices in use before the discharge or before receiving the notice or order
4. Description of water pollution control practices and corrective actions taken to manage the discharge or cause of the notice

Quality Control and Assurance

Training

Employees must receive initial water pollution control training before starting work at the job site.

For your project managers, supervisory personnel, subcontractors, and employees involved in water pollution control work:

1. Provide stormwater training in the following subjects:

    1.1. Water pollution control rules and regulations
    1.2. Implementation and maintenance for:

        1.2.1. Temporary soil stabilization
        1.2.2. Temporary sediment control
        1.2.3. Tracking control
        1.2.4. Wind erosion control
        1.2.5. Material pollution prevention and control
        1.2.6. Waste management
        1.2.7. Nonstormwater management

2. Conduct weekly training meetings covering:

    2.1. Deficiencies and corrective actions for water pollution control practices
    2.2. Water pollution control practices required for work activities during the week
    2.3. Spill prevention and control
    2.4. Material delivery, storage, usage, and disposal
    2.5. Waste management
    2.6. Nonstormwater management procedures

Training for personnel who collect water quality samples must include:

1. CSMP review
2. Health and safety review
3. Sampling simulations

Water Pollution Control Manager

General

The WPC manager must be a QSD. Assign 1 WPC manager to implement the SWPPP. You may assign a QSD other than the WPC manager to develop the SWPPP.

Qualifications

A QSD must:

1. Have completed stormwater management training described in the Department's Web site for the Division of Construction, Storm Water and Water Pollution Control Information
2. Be one or more of the following:

    2.1. California registered civil engineer
    2.2. California registered professional geologist or engineering geologist
    2.3. California licensed landscape architect
    2.4. Professional hydrologist registered through the American Institute of Hydrology
    2.5. Certified Professional in Erosion and Sediment Control (CPESC)™ registered through Enviro Cert International, Inc.
    2.6. Certified Professional in Storm Water Quality (CPSWQ)™ registered through Enviro Cert International, Inc.
    2.7. Professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET)

3. Have completed SWRCB approved QSD training and passed the QSD exam

Responsibilities

The WPC manager must:

1. Be responsible for water pollution control work
2. Be the primary contact for water pollution control work
3. Oversee:

    3.1. Maintenance of water pollution control practices
    3.2. Inspections of water pollution control practices identified in the SWPPP
    3.3. Inspections and reports for visual monitoring
    3.4. Preparation and implementation of REAPs
    3.5. Sampling and analysis
    3.6. Preparation and submittal of:

        3.6.1. NAL exceedance reports
        3.6.2. NEL violation reports
        3.6.3. SWPPP annual certification
        3.6.4. Annual reports
        3.6.5. BMP status reports

4. Oversee and enforce hazardous waste management practices including spill prevention and control measures
5. Have authority to mobilize crews to make immediate repairs to water pollution control practices
6. Ensure that all employees have current water pollution control training
7. Implement the approved SWPPP
8. Amend the SWPPP if required
9. Be at the job site within 2 hours of being contacted
10. Have the authority to stop construction activities damaging water pollution control practices or causing water pollution

Sampling and Analysis

Assign trained personnel to collect water quality samples. Document the personnel and training in the SAP.

Samples taken by assigned field personnel must comply with the equipment manufacturer's instructions for collection, analytical methods, and equipment calibration.

Samples taken for laboratory analysis must comply with water quality sampling procedures and be analyzed by a State-certified laboratory under 40 CFR part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants.

Whenever downstream samples show increased levels of pollutants, assess water pollution control practices, site conditions, and surrounding influences to determine the probable cause for the increase.

For a risk level 2 or risk level 3 project, obtain samples of pH and turbidity by the test methods shown in the following table:

Parameter	Test method	Detection limit (min)	Unit
pH	Field test with calibrated portable instrument	0.2	pH units
Turbidity	Field test with calibrated portable instrument	1	NTU

Whenever the turbidity NEL is exceeded for a risk level 3 project, obtain samples and analyze the suspended sediment concentration by the test method shown in the following table:

Parameter	Test method	Detection limit (min)	Unit
Suspended sediment concentration	ASTM D 3977	5	Mg/L

For a risk level 3 project, obtain samples of pH and turbidity from representative and accessible locations upstream of the discharge point and downstream of the discharge point.

For multiple discharge points, obtain samples from a single upstream and a single downstream location.

Numeric Action Levels

For a risk level 2 or risk level 3 project, NALs must comply with the values shown in the following table:

Numeric Action Levels

Parameter	Test method	Detection limit (min)	Unit	Value
pH	Field test with calibrated portable instrument	0.2	pH	Lower NAL = 6.5 Upper NAL = 8.5
Turbidity	Field test with calibrated portable instrument	1	NTU	250 NTU max

The storm event daily average must not exceed the NAL for pH.

The storm event daily average must not exceed the NAL for turbidity.

Numeric Effluent Limits

For a risk level 3 project, NELs must comply with the values shown in the following table:

Numeric Effluent Limits

Parameter	Test method	Detection limit (min)	Unit	Value
pH	Field test with calibrated portable instrument	0.2	pH	Lower NEL = 6.0 Upper NEL = 9.0
Turbidity	Field test with calibrated portable instrument	1	NTU	500 NTU max

The storm event daily average for storms up to the 5-year, 24-hour storm must not exceed the NEL for turbidity. The daily average sampling results must not exceed the NEL for pH.

MATERIALS

Not Used

CONSTRUCTION

General

Manage work activities to reduce the discharge of pollutants to surface waters, groundwater, and municipal separate storm sewer systems.

Retain a printed copy of the approved SWPPP at the job site.

Install facilities and devices used for water pollution control practices before performing work activities. Install soil stabilization materials for water pollution control practices in all inactive areas or before storm events.

Repair or replace water pollution control practices within 24 hours of discovering any damage, unless a longer period is authorized.

The Department does not pay for the cleanup, repair, removal, disposal, or replacement of water pollution control practices due to improper installation or your negligence.

You may request changes to the water pollution control work or the Engineer may order changes to water pollution control work. Changes may include additional or new water pollution control practices. Additional water pollution control work is paid for as extra work under Section 4-1.03D, "Extra Work," of the Standard Specifications.

You may request or the Engineer may order laboratory analysis of stormwater samples. If ordered, laboratory analysis of stormwater samples is paid for as extra work under Section 4-1.03D, "Extra Work," of the Standard Specifications.

Continue SWPPP implementation during any suspension of work activities.

Monitoring

Monitor the National Weather Service's forecast on a daily basis. For the National Weather Service's forecast, go to the Web site for the National Weather Service.

Obtain, install, and maintain a rain gauge at the job site. Observe and record daily precipitation.

Inspections

Use the Stormwater Site Inspection Report form for documenting site inspections.

The WPC manager must oversee:

1. Inspections of water pollution control practices identified in SWPPP:

    1.1. Before a forecasted storm event
    1.2. After a qualifying rain event that produces site runoff
    1.3. At 24-hour intervals during extended storm events
    1.4. On a predetermined schedule of at least once a week

2. Daily inspections of:

    2.1. Storage areas for hazardous materials and waste
    2.2. Hazardous waste disposal and transporting activities
    2.3. Hazardous material delivery and storage activities

3. Inspections of:

    3.1. Vehicle and equipment cleaning facilities:

        3.1.1. Daily if vehicle and equipment cleaning occurs daily
        3.1.2. Weekly if vehicle and equipment cleaning does not occur daily

    3.2. Vehicle and equipment maintenance and fueling areas:

        3.2.1. Daily if vehicle and equipment maintenance and fueling occurs daily
        3.2.2. Weekly if vehicle and equipment maintenance and fueling does not occur daily

    3.3. Vehicles and equipment at the job site for leaks and spills on a daily schedule. Verify that operators are inspecting vehicles and equipment each day of use.
    3.4. Demolition sites within 50 feet of storm drain systems and receiving waters daily.
    3.5. Pile driving areas for leaks and spills:

        3.5.1. Daily if pile driving occurs daily
        3.5.2. Weekly if pile driving does not occur daily

    3.6. Temporary concrete washouts:

        3.6.1. Daily if concrete work occurs daily
        3.6.2. Weekly if concrete work does not occur daily

    3.7. Paved roads at job site access points for street sweeping:

        3.7.1. Daily if earthwork and other sediment or debris-generating activities occur daily
        3.7.2. Weekly if earthwork and other sediment or debris-generating activities do not occur daily
        3.7.3. Within 24 hours of precipitation forecasted by the National Weather Service

    3.8. Dewatering work:

        3.8.1. Daily if dewatering work occurs daily
        3.8.2. Weekly if dewatering work does not occur daily

    3.9. Temporary active treatment system:

        3.9.1. Daily if temporary active treatment system activities occur daily
        3.9.2. Weekly if temporary active treatment system activities do not occur daily

    3.10. Work over water:

        3.10.1. Daily if work over water occurs daily
        3.10.2. Weekly if work over water does not occur daily

Deficiencies

Whenever you or the Engineer identify a deficiency in the implementation of the approved SWPPP, correct the deficiency:

1. Immediately, unless a later date is authorized
2. Before precipitation occurs

The Department may correct the deficiency and deduct the cost of correcting the deficiency from payment if you fail to correct the deficiency by the agreed date or before the onset of precipitation.

Rain Event Action Plan

For a risk level 2 or risk level 3 project, have the REAP at the job site at least 24 hours before a forecasted storm event. The WPC manager must submit the REAP on the following forms:

1. Rain Event Action Plan Highway Construction Phase
2. Rain Event Action Plan Plant Establishment Phase
3. Rain Event Action Plan For Inactive Project

Retain a printed copy of each REAP at the job site as part of the SWPPP.

Implement the REAP, including mobilizing crews to complete activities, within 24 hours before precipitation occurs.

Sampling and Analysis

Perform sample collection during:

1. Normal working hours
2. Each qualifying rain event
3. First 2 hours of each storm event

Do not physically collect samples during dangerous weather conditions, such as flooding or electrical storms.

Document sample collection during precipitation.

Whenever downstream samples show increased levels of pH, turbidity, and other constituents, assess water pollution control practices, site conditions, and surrounding influences to determine the probable cause for the increase.

Collect samples:

1. During a storm event for:

    1.1. Each nonvisible pollutant source and a corresponding uncontaminated control sample
    1.2. All locations identified on the Storm Event Sampling and Analyses Plan form

2. During a qualifying rain event for:

    2.1. Each nonvisible pollutant source and a corresponding uncontaminated control sample
    2.2. pH, turbidity, and other constituents as required
    2.3. At least 3 samples for each day of a qualifying rain event
    2.4. All locations identified on the Qualifying Rain Event Sampling and Analyses Plan form

Collect receiving-water samples for a risk level 3 project and whenever a direct discharge to receiving waters occurs and NELs are violated.

Retain documentation of water quality sampling and analysis results with the SWPPP at the job site.

The Department does not pay for the preparation, collection, laboratory analysis, and reporting of stormwater samples for nonvisible pollutants if water pollution control practices are not implemented before precipitation or if you fail to correct a water pollution control practice before precipitation.

MEASUREMENT AND PAYMENT

The contract lump sum price for prepare storm water pollution prevention plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in developing and implementing a SWPPP, including providing a WPC manager, conducting water pollution control training, and monitoring, inspecting and correcting water pollution control practices at the job site, as shown on the plans, as specified in the Standard Specifications and these special provisions, and directed by the Engineer.

For projects with 60 working days or less, the Department pays you for prepare stormwater pollution prevention plan as follows:

1. A total of 75 percent of the item total upon approval of the SWPPP
2. A total of 100 percent of the item total upon contract acceptance

For projects with more than 60 working days, the Department pays you for prepare stormwater pollution prevention plan as follows:

1. A total of 50 percent of the item total upon approval of the SWPPP
2. A total of 90 percent of the item total over the life of the contract
3. A total of 100 percent of the item total upon contract acceptance

If risk level 2 or 3, the Department pays $500 for each rain event action plan submitted. The contract unit price paid for rain event action plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing REAPs, including preparing and submitting REAP forms, and monitoring weather forecasts, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The Department does not adjust payment for an increase or decrease in the quantity of rain event action plan. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

The Department pays $2,000 for each storm water annual report submitted. The contract unit price paid for storm water annual report includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and submitting storm water annual reports, including annual certifications, monitoring reports, inspection, and sampling results, and obtaining acceptance of storm water annual reports, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The Department does not adjust payment for an increase or decrease in the quantity of storm water annual report. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

The work to complete the final storm water annual report contract item is excluded from Section 7-1.17, "Acceptance of Contract," of the Standard Specifications.

If risk level 2 or 3, the contract unit price paid for storm water sampling and analysis day includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in reporting on stormwater quality per storm events and qualifying rain events, including preparation, collection, analysis of stormwater samples for pH, turbidity, and other constituents, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. A single day of sampling is counted as 1 unit.

The Department does not adjust payment for an increase or decrease in the quantity of storm water sampling and analysis day. Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications does not apply.

The Department does not pay for the preparation, collection, laboratory analysis, and reporting of stormwater samples for nonvisible pollutants if water pollution control practices are not implemented before precipitation or if you fail to correct a water pollution control practice before precipitation.

For each failure to submit a completed storm water annual report, the Department withholds $10,000. This withhold is in addition to other withholds under Section 9-1.07E(3) "Performance Failure Withholds," of the Standard Specifications.

Each failure to comply with any part of these special provisions and each failure to implement water pollution control practices are considered separate performance failures.

10-1.04 CONSTRUCTION SITE MANAGEMENT

GENERAL

Summary

This work includes preventing and controlling spills, dewatering, and managing materials, waste, and nonstormwater.

Implement effective handling, storage, usage, and disposal practices to control material pollution and manage waste and nonstormwater at the job site before they come in contact with storm drain systems and receiving waters.

The following abbreviations are used in this special provision:

DTSC: Department of Toxic Substance Control.
ELAP: Environmental Laboratory Accreditation Program.
WPC: Water Pollution Control.

Submittals

Before you start dewatering, submit a dewatering and discharge work plan under Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and "Water Pollution Control" of these special provisions. The dewatering and discharge work plan must include:

1. Title sheet and table of contents
2. Description of dewatering and discharge activities detailing locations, quantity of water, equipment, and discharge point
3. Estimated schedule for dewatering and discharge start and end dates of intermittent and continuous activities
4. Discharge alternatives, such as dust control or percolation
5. Visual monitoring procedures with inspection log
6. Copy of written approval to discharge into a sanitary sewer system at least 5 business days before starting discharge activities

Submit the following:

1. Material Safety Data Sheet at least 5 business days before material is used or stored
2. Monthly inventory records for material used or stored

Submit written approval from the local health agency, city, county, and sewer district before discharging from a sanitary or septic system directly into a sanitary sewer system.

MATERIALS

Not Used

CONSTRUCTION

Spill Prevention and Control

General

Keep material or waste storage areas clean, well organized, and equipped with enough cleanup supplies for the material being stored.

Implement spill and leak prevention procedures for chemicals and hazardous substances stored on the job site. Whenever you spill or leak chemicals or hazardous substances at the job site, you are responsible for all associated cleanup costs and related liability.

Report minor, semi-significant, and significant or hazardous spills to the WPC manager. The WPC manager must notify the Engineer immediately.

As soon as it is safe, contain and clean up spills of petroleum materials and sanitary and septic waste substances listed under 40 CFR, Parts 110, 117, and 302.

Minor Spills

Minor spills consist of quantities of oil, gasoline, paint, or other materials that are small enough to be controlled by a 1st responder upon discovery of the spill.

Clean up a minor spill using the following procedures:

1. Contain the spread of the spill
2. Recover the spilled material using absorption
3. Clean the contaminated area
4. Dispose of the contaminated material and absorbents promptly and properly under "Waste Management" of these special provisions

Semi-Significant Spills

Semi-significant spills consist of spills that can be controlled by a 1st responder with help from other personnel. Clean up a semi-significant spill immediately using the following procedures:

1. Contain the spread of the spill.
2. On paved or impervious surfaces, encircle and recover the spilled material with absorbent materials. Do not allow the spill to spread widely.
3. If the spill occurs on soil, contain the spill by constructing an earthen dike and dig up the contaminated soil for disposal.
4. If the spill occurs during precipitation, cover the spill with 10-mil plastic sheeting or other material to prevent contamination of runoff.
5. Dispose of the contaminated material promptly and properly under "Waste Management" of these special provisions.

Significant or Hazardous Spills

Significant or hazardous spills consist of spills that cannot be controlled by job site personnel. Immediately notify qualified personnel of a significant or hazardous spill. Take the following steps:

1. Do not attempt to clean up the spill until qualified personnel have arrived
2. Notify the Engineer and follow up with a report
3. Obtain the immediate services of a spill contractor or hazardous material team
4. Notify local emergency response teams by dialing 911 and county officials by using the emergency phone numbers retained at the job site
5. Notify the California Emergency Management Agency State Warning Center at (916) 845-8911
6. Notify the National Response Center at (800) 424-8802 regarding spills of Federal reportable quantities under 40 CFR 110, 119, and 302
7. Notify other agencies as appropriate, including:

    7.1. Fire Department
    7.2. Public Works Department
    7.3. Coast Guard
    7.4. Highway Patrol
    7.5. City Police or County Sheriff's Department
    7.6. Department of Toxic Substances
    7.7. California Division of Oil and Gas
    7.8. Cal/OSHA
    7.9. Regional Water Resources Control Board

Prevent a spill from entering stormwater runoff before and during cleanup activities. Do not bury or wash the spill with water.

Material Management

General

Minimize or eliminate discharge of material into the air, storm drain systems, and receiving waters while taking delivery of, using, or storing the following materials:

1. Hazardous chemicals, including acids, lime, glues, adhesives, paints, solvents, and curing compounds
2. Soil stabilizers and binders
3. Fertilizers
4. Detergents
5. Plaster
6. Petroleum materials, including fuel, oil, and grease
7. Asphalt and concrete components
8. Pesticides and herbicides

Employees trained in emergency spill cleanup procedures must be present during the unloading of hazardous materials or chemicals.

Use less hazardous materials if practicable.

The following activities must be performed at least 100 feet from concentrated flows of stormwater, drainage courses, and inlets if within the floodplain and at least 50 feet if outside the floodplain, unless otherwise approved by the Engineer:

1. Stockpiling materials
2. Storing pile-driving equipment and liquid waste containers
3. Washing vehicles and equipment in outside areas
4. Fueling and maintaining vehicles and equipment

Material Storage

If materials are stored:

1. Store liquids, petroleum materials, and substances listed in 40 CFR 110, 117, and 302 and place them in secondary containment facilities as specified by US DOT for storage of hazardous materials.
2. Secondary containment facilities must be impervious to the materials stored there for a minimum contact time of 72 hours.
3. Cover secondary containment facilities during non-working days and whenever precipitation is forecasted. Secondary containment facilities must be adequately ventilated.
4. Keep secondary containment facilities free of accumulated rainwater or spills. After precipitation, or in the event of spills or leaks, collect accumulated liquid and place it into drums within 24 hours. Handle the liquid as hazardous waste under "Waste Management" of these special provisions unless testing confirms that the liquid is nonhazardous.
5. Do not store incompatible materials, such as chlorine and ammonia, in the same secondary containment facility.
6. Store materials in their original containers with the original material labels maintained in legible condition. Immediately replace damaged or illegible labels.
7. Secondary containment facilities must have the capacity to contain precipitation from a 24-hour-long, 25-year storm, plus 10 percent of the aggregate volume of all containers or the entire volume of the largest container within the facility, whichever is greater.
8. Store bagged or boxed material on pallets. Protect bagged or boxed material from wind and rain during non-working days and whenever precipitation is forecasted.
9. Provide sufficient separation between stored containers to allow for spill cleanup or emergency response access. Storage areas must be kept clean, well organized, and equipped with cleanup supplies appropriate for the materials being stored.
10. Repair or replace perimeter controls, containment structures, covers, and liners as necessary. Inspect storage areas before and after precipitation and at least weekly during other times.

Stockpile Management

Minimize stockpiling of materials at the job site.

Implement water pollution control practices within 72 hours of stockpiling material or before a forecasted storm event, whichever occurs first. If stockpiles are being used, do not allow soil, sediment, or other debris to enter storm drains, open drainages, and watercourses.

Active and inactive soil stockpiles must be:

1. Covered with soil stabilization material or a temporary cover
2. Surrounded with a linear sediment barrier

Stockpiles of asphalt concrete and PCC rubble, HMA, aggregate base, or aggregate subbase must be:

1. Covered with a temporary cover
2. Surrounded with a linear sediment barrier

Stockpiles of pressure-treated wood must be:

1. Placed on pallets
2. Covered with impermeable material

Stockpiles of cold mix asphalt concrete must be:

1. Placed on an impervious surface
2. Covered with an impermeable material
3. Protected from stormwater run-on and runoff

Control wind erosion year round under Section 14-9.02, "Dust Control," of the Standard Specifications.

Repair or replace linear sediment barriers and covers as needed to keep them functioning properly. Whenever sediment accumulates to 1/3 of the linear sediment barrier height, remove the accumulated sediment.

Waste Management

Solid Waste

Do not allow litter, trash, or debris to accumulate anywhere on the job site, including storm drain grates, trash racks, and ditch lines. Pick up and remove litter, trash, and debris from the job site at least once a week. The WPC manager must monitor solid waste storage and disposal procedures on the job site.

If practicable, recycle nonhazardous job site waste and excess material. If recycling is not practicable, dispose of it under Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way," of the Standard Specifications.

Furnish enough closed-lid dumpsters of sufficient size to contain the solid waste generated by work activities. When refuse reaches the fill line, empty the dumpsters. Dumpsters must be watertight. Do not wash out dumpsters at the job site. Furnish additional containers and pick up dumpsters more frequently during the demolition phase of construction.

Solid waste includes:

1. Brick
2. Mortar
3. Timber
4. Metal scraps
5. Sawdust
6. Pipe
7. Electrical cuttings
8. Nonhazardous equipment parts
9. Styrofoam and other packaging materials
10. Vegetative material and plant containers from highway planting
11. Litter and smoking material, including litter generated randomly by the public
12. Other trash and debris

Furnish and use trash receptacles in the job site yard, field trailers, and locations where workers gather for lunch and breaks.

Hazardous Waste and Contamination

If hazardous waste is, or will be, generated on the job site, the WPC manager must be thoroughly familiar with proper hazardous waste handling and emergency procedures under 40 CFR § 262.34(d)(5)(iii) and must have successfully completed training under 22 CA Code of Regs § 66265.16.

The WPC manager must:

1. Oversee and enforce hazardous waste management practices
2. Inspect all hazardous waste storage areas daily, including all temporary containment facilities and satellite collection locations
3. Oversee all hazardous waste transportation activities on the job site

Submit a copy of uniform hazardous waste manifest forms to the Engineer within 24 hours of transporting hazardous waste.

Submit receiving landfill documentation of proper disposal to the Engineer within 5 business days of hazardous waste transport from the project.

Unanticipated Discovery of Asbestos and Hazardous Substances

Upon discovery of asbestos or a hazardous substance, comply with Section 14-11.02, "Asbestos and Hazardous Substances," of the Standard Specifications.

Hazardous Waste Management Practices

Handle, store, and dispose of hazardous waste under 22 CA Code of Regs Div 4.5.
Use the following storage procedures:

1. Store hazardous waste and potentially hazardous waste separately from nonhazardous waste at the job site.
2. For hazardous waste storage, use metal containers approved by the United States Department of Transportation for the transportation and temporary storage of hazardous waste.
3. Store hazardous waste in sealed, covered containers labeled with the contents and accumulation start date under 22 CA Code of Regs, Div 4.5. Labels must comply with the provisions of 22 CA Code of Regs, Div 4.5.§ 66262.31 and § 66262.32. Immediately replace damaged or illegible labels.
4. Handle hazardous waste containers such that no spillage occurs.
5. Store hazardous waste away from storm drains, watercourses, moving vehicles, and equipment.
6. Furnish containers with adequate storage volume at convenient satellite locations for hazardous waste collection. Immediately move these containers to secure temporary containment facilities when no longer needed at the collection location or when full.
7. Store hazardous waste and potentially hazardous waste in secure temporary containment enclosures having secondary containment facilities impervious to the materials stored there for a minimum contact-time of 72 hours. Temporary containment enclosures must be located away from public access. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the project limits.
8. Design and construct secondary containment facilities with a capacity to contain precipitation from a 24-hour-long, 25-year storm; and 10 percent of the aggregate volume of all containers, or the entire volume of the largest container within the facility, whichever is greater.
9. Cover secondary containment facilities during non-working days and if a storm event is predicted. Secondary containment facilities must be adequately ventilated.
10. Keep secondary containment facility free of accumulated rainwater or spills. After a storm event, or in the event of spills or leaks, collect accumulated liquid and place into drums within 24 hours. Handle these liquids as hazardous waste unless testing determines them to be nonhazardous.
11. Do not store incompatible wastes, such as chlorine and ammonia, in the same secondary containment facility.
12. Provide sufficient separation between stored containers to allow for spill cleanup or emergency response access. Storage areas must be kept clean, well organized, and equipped with cleanup supplies appropriate for the wastes being stored.
13. Repair or replace perimeter controls, containment structures, covers, and liners as necessary. Inspect storage areas before and after a storm event, and at least weekly during other times.

Do not:

1. Overfill hazardous waste containers
2. Spill hazardous waste or potentially hazardous waste
3. Mix hazardous wastes
4. Allow hazardous waste or potentially hazardous waste to accumulate on the ground

Dispose of hazardous waste within 90 days of the start of generation. Use a hazardous waste manifest and a transporter registered with the DTSC and in compliance with the CA Highway Patrol Biennial Inspection of Terminals Program to transport hazardous waste to an appropriately permitted hazardous waste management facility.

Dust Control for Hazardous Waste or Contamination

Excavation, transportation, and handling of material containing hazardous waste or contamination must result in no visible dust migration. Have a water truck or tank on the job site at all times while clearing and grubbing and performing earthwork operations in work areas containing hazardous waste or contamination.

Stockpiling of Hazardous Waste or Contamination

Do not stockpile material containing hazardous waste or contamination unless ordered. Stockpiles of material containing hazardous waste or contamination must not be placed where affected by surface run-on or run-off. Cover stockpiles with 13 mils minimum thickness of plastic sheeting or 1 foot of nonhazardous material. Do not place stockpiles in environmentally sensitive areas. Stockpiled material must not enter storm drains, inlets, or waters of the State.

Contractor-Generated Hazardous Waste

You are the generator of hazardous waste generated as a result of materials you bring to the job site. Use hazardous waste management practices if you generate waste on the job site from the following substances:

1. Petroleum materials
2. Asphalt materials
3. Concrete curing compound
4. Pesticides
5. Acids
6. Paints
7. Stains
8. Solvents
9. Wood preservatives
10. Roofing tar
11. Road flares
12. Lime
13. Glues and adhesives
14. Materials classified as hazardous waste under 22 CA Code of Regs, Div 4.5

If hazardous waste constituent concentrations are unknown, use a laboratory certified by the ELAP under the California Department Of Public Health to analyze a minimum of 4 discrete representative samples of the waste to determine whether it is a hazardous waste and to determine safe and lawful methods for storage and disposal. Perform sampling and analysis in compliance with US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) and under 22 CA Code of Regs, Div 4.5.

Use your US EPA Generator Identification Number and sign hazardous waste manifests for the hazardous waste you generate.

Identify contaminated soil resulting from spills or leaks by noticing discoloration, or differences in soil properties. Immediately notify the Engineer of spills or leaks. Clean up spills and leaks under the Engineer's direction and to the satisfaction of the Engineer. Soil with evidence of contamination must be sampled and analysis performed by a laboratory certified by ELAP.

If sampling and analysis of contaminated soil demonstrates that it is a hazardous waste, handle and dispose of the soil as hazardous waste. You are the generator of hazardous waste created as the result of spills or leaks for which you are responsible.

Prevent the flow of water, including ground water, from mixing with contaminated soil by using one or a combination of the following measures:

1. Berms
2. Cofferdams
3. Grout curtains
4. Freeze walls
5. Concrete seal course

If water mixes with contaminated soil and becomes contaminated, sample and analyze the water using a laboratory certified by the ELAP. If analysis results demonstrate that the water is a hazardous waste, manage and dispose of the water as hazardous waste.

Department-Generated Hazardous Waste

If the Department is the generator of hazardous waste during the work performed on this project, use hazardous waste management practices.

Labels must comply with the provisions of 22 CA Code of Regs § 66262.31 and § 66262.32. Mark labels with:

1. Date the hazardous waste is generated
2. The words "Hazardous Waste"
3. Composition and physical state of the hazardous waste (for example, asphalt grindings with thermoplastic or paint)
4. The word "Toxic"
5. Name, address, and telephone number of the Engineer
6. Contract number
7. Contractor or subcontractor name

Handle the containers such that no spillage occurs.

Hazardous Waste Transport and Disposal

Dispose of hazardous waste within California at a disposal site operating under a permit issued by the DTSC.

The Engineer will obtain the US EPA Generator Identification Number for hazardous waste disposal.

The Engineer will sign all hazardous waste manifests. Notify the Engineer 5 business days before the manifests are to be signed.

The Department will not consider you a generator of the hazardous waste and you will not be obligated for further cleanup, removal, or remedial action for such material if handled or disposed of under these specifications and the appropriate State and federal laws and regulations and county and municipal ordinances and regulations regarding hazardous waste.

Paint Waste

Clean water-based and oil-based paint from brushes or equipment within a contained area in a way that does not contaminate soil, receiving waters, or storm drain systems. Handle and dispose of the following as hazardous waste: paints, thinners, solvents, residues, and sludges that cannot be recycled or reused. When thoroughly dry, dispose of the following as solid waste: dry latex paint, paint cans, used brushes, rags, absorbent materials, and drop cloths.

Concrete Waste

Use practices to prevent the discharge of asphalt concrete, PCC, and HMA waste into storm drain systems and receiving waters.

Collect and dispose of asphalt concrete, PCC, and HMA waste generated at locations where:

1. Concrete material, including grout, is used
2. Concrete dust and debris result from demolition
3. Sawcutting, coring, grinding, grooving, or hydro-concrete demolition creates a residue or slurry
4. Concrete trucks or other concrete-coated equipment is cleaned at the job site

Sanitary and Septic Waste

Do not bury or discharge wastewater from a sanitary or septic system within the highway. A sanitary facility discharging into a sanitary sewer system must be properly connected and free from leaks. Place a portable sanitary facility at least 50 feet away from storm drains, receiving waters, and flow lines.

Comply with local health agency provisions if using an on-site disposal system.

Liquid Waste

Use practices that will prevent job-site liquid waste from entering storm drain systems and receiving waters. Liquid waste include the following:

1. Drilling slurries or fluids
2. Grease-free and oil-free wastewater and rinse water
3. Dredgings, including liquid waste from cleaning drainage systems
4. Liquid waste running off a surface, including wash or rinse water
5. Other nonstormwater liquids not covered by separate permits

Hold liquid waste in structurally sound, leak-proof containers, such as roll-off bins or portable tanks.

Liquid waste containers must be of sufficient quantity and volume to prevent overflow, spills, and leaks.

Store containers at least 50 feet from moving vehicles and equipment.

Remove and dispose of deposited solids from sediment traps unless the Engineer approves another method.

Liquid waste may require testing to determine hazardous material content before disposal.

Dispose of drilling fluids and residue.

If a location approved by the Engineer is available within the job site, fluids and residue exempt under 23 CA Code of Regs § 2511(g) may be dried by evaporation in a leak-proof container. Dispose of the remaining as solid waste.

Nonstormwater Management

Water Control and Conservation

Manage water used for work activities in a way that will prevent erosion and the discharge of pollutants into storm drain systems and receiving waters. Obtain authorization before washing anything at the job site with water that could discharge into a storm drain system or receiving waters. Report discharges immediately.

Implement water conservation practices if water is used at the job site. Inspect irrigation areas. Adjust watering schedules to prevent erosion, excess watering, or runoff. Shut off the water source to broken lines, sprinklers, or valves and repair breaks within 24 hours. Reuse water from waterline flushing for landscape irrigation if practicable. Sweep and vacuum paved areas. Do not wash paved areas with water.

Direct runoff water, including water from water line repair, from the job site to areas where it can infiltrate into the ground. Do not allow runoff water to enter storm drain systems and receiving waters. Do not allow spilled water to escape filling areas for water trucks. Direct water from off-site sources around the job site if practicable. Minimize the contact of off-site water with job site water.

Illegal Connection and Discharge Detection and Reporting

Before starting work, inspect the job site and the job site's perimeter for evidence of illicit connections, illegal discharges, and dumping. After starting work, inspect the job site and perimeter on a daily schedule for illicit connections and illegal dumping and discharges.

Whenever illegal connections, discharges, or dumping are discovered, notify the Engineer immediately. Do not take further action unless ordered. Assume that unlabeled or unidentifiable material is hazardous.

Look for the following evidence of illicit connections, illegal discharges, and dumping:

1. Debris or trash piles
2. Staining or discoloration on pavement or soils
3. Pungent odors coming from drainage systems
4. Discoloration or oily sheen on water
5. Stains and residue in ditches, channels, or drain boxes
6. Abnormal water flow during dry weather
7. Excessive sediment deposits
8. Nonstandard drainage junction structures
9. Broken concrete or other disturbances at or near junction structures

Vehicle and Equipment Cleaning

Limit vehicle and equipment cleaning or washing at the job site except what is necessary to control vehicle tracking or hazardous waste. Notify the Engineer before cleaning vehicles and equipment at the job site with soap, solvents, or steam. Contain and recycle or dispose of resulting waste under "Waste Management" of these special provisions, whichever is applicable. Do not use diesel to clean vehicles or equipment. Minimize the use of solvents.

Clean or wash vehicles and equipment in a structure equipped with disposal facilities. You may wash vehicles in an outside area if the area is:

1. Paved with asphalt concrete, HMA, or PCC
2. Surrounded by a containment berm
3. Equipped with a sump to collect and dispose of wash water

Use as little water as practicable whenever washing vehicles and equipment with water. Hoses must be equipped with a positive shutoff valve.

Discharge liquid from wash racks to a recycling system or to another system approved by the Engineer. Remove liquids and sediment as necessary.

Vehicle and Equipment Fueling and Maintenance

If practicable, perform maintenance on vehicles and equipment off-site.

If fueling or maintenance must be done at the job site, assign a site or sites, and obtain authorization before using them. Minimize mobile fueling and maintenance activities. Fueling and maintenance activities must be performed on level ground in areas protected from stormwater run-on and runoff.

Use containment berms or dikes around fueling and maintenance areas. Keep adequate quantities of absorbent spill-cleanup material and spill kits in the fueling or maintenance area and on fueling trucks. Dispose of spill-cleanup material and kits immediately after use under "Waste Management" of these special provisions. Use drip pans or absorbent pads during fueling or maintenance.

Do not leave fueling or maintenance areas unattended during fueling and maintenance activities. Fueling nozzles must be equipped with an automatic shutoff control. Nozzles must be equipped with vapor-recovery fueling nozzles where required by the Air Quality Management District. Secure nozzles in an upright position when not in use. Do not top off fuel tanks.

Recycle or properly dispose of used batteries and tires under "Waste Management" of these special provisions.

If leaks cannot be repaired immediately, remove the vehicle or equipment from the job site.

Material and Equipment Used Over Water

Place drip pans and absorbent pads under vehicles and equipment used over water. Keep an adequate supply of spill-cleanup material with vehicles and equipment. Place drip pans or plastic sheeting under vehicles and equipment on docks, barges, or other surfaces over water whenever vehicles or equipment will be idle for more than 1 hour.

Furnish watertight curbs or toe boards on barges, platforms, docks, or other surfaces over water to contain material, debris, and tools. Secure material to prevent spills or discharge into the water due to wind.

Report discharges to receiving waters immediately upon discovery. Submit a discharge notification to the Engineer.

Structure Removal Over or Adjacent to Water

Do not allow demolished material to enter storm drain systems and receiving waters. Use covers and platforms approved by the Engineer to collect debris. Use attachments on equipment to catch debris during small demolition activities. Empty debris-catching devices daily.

Paving, Sealing, Sawcutting, Grooving, and Grinding Activities

Prevent material from entering storm drain systems and receiving waters including:

1. Cementitious material
2. Asphaltic material
3. Aggregate or screenings
4. Sawcutting, grooving, and grinding residue
5. Pavement chunks
6. Shoulder backing
7. Methacrylate
8. Sandblasting residue

Cover drainage inlets and use linear sediment barriers to protect downhill receiving waters until paving, sealing, sawcutting, grooving, and grinding activities are completed and excess material has been removed. Cover drainage inlets and manholes during the application of seal coat, tack coat, slurry seal, or fog seal.

Whenever precipitation is forecasted, limit paving, sawcutting, and grinding to places where runoff can be captured.

Do not start seal coat, tack coat, slurry seal, or fog seal activities whenever precipitation is forecasted during the application and curing period. Do not excavate material from existing roadways during precipitation.

Use a vacuum to remove slurry immediately after slurry is produced. Do not allow the slurry to run onto lanes open to traffic or off the pavement.

Collect the residue from PCC grooving and grinding activities with a vacuum attachment on the grinding machine. Do not leave the residue on the pavement or allow the residue to flow across pavement.

You may stockpile material excavated from existing roadways under "Material Management" of these special provisions if approved by the Engineer.

Do not coat asphalt trucks and equipment with substances that contain soap, foaming agents, or toxic chemicals.

Park paving equipment over drip pans or plastic sheeting with absorbent material to catch drips if the paving equipment is not in use.

Thermoplastic Striping and Pavement Markers

Do not preheat, transfer, or load thermoplastic within 50 feet of drainage inlets and receiving waters.

Do not unload, transfer, or load bituminous material for pavement markers within 50 feet of drainage inlets and receiving waters.

Collect and dispose of bituminous material from the roadway after removing markers under "Waste Management" of these special provisions.

Pile Driving

Keep spill kits and cleanup materials at pile driving locations. Park pile driving equipment over drip pans, absorbent pads, or plastic sheeting with absorbent material. Protect pile driving equipment by parking on plywood and covering with plastic whenever precipitation is forecasted.

Store pile driving equipment on level ground and protect it from stormwater run-on when not in use. Use vegetable oil instead of hydraulic fluid if practicable.

Concrete Curing

Do not overspray chemical curing compounds. Minimize the drift by spraying as close to the concrete as practicable. Do not allow runoff of curing compounds. Cover drainage inlets before applying the curing compound.

Minimize the use and discharge of water by using wet blankets or similar methods to maintain moisture when concrete is curing.

Concrete Finishing

Collect and dispose of water and solid waste from high-pressure water blasting under "Waste Management" of these special provisions. Collect and dispose of sand and solid waste from sandblasting under "Waste Management" of these special provisions. Before sandblasting, cover drainage inlets within 50 feet of sandblasting. Minimize the drift of dust and blast material by keeping the nozzle close to the surface of the concrete. If the character of the blast residue is unknown, test it for hazardous materials and dispose of it properly.

Inspect containment structures for concrete finishing for damage before each day of use and before forecasted precipitation. Remove liquid and solid waste from containment structures after each work shift.

Sweeping

Sweep by hand or mechanical methods, such as vacuuming. Do not use methods that use only mechanical kick brooms.

Sweep paved roads at construction entrance and exit locations and paved areas within the job site:

1. During clearing and grubbing activities
2. During earthwork activities
3. During trenching activities
4. During roadway structural-section activities
5. When vehicles are entering and leaving the job site
6. After soil-disturbing activities
7. After observing off-site tracking of material

Monitor paved areas and roadways within the project. Sweep within:

1. 1 hour whenever sediment or debris is observed during activities that require sweeping
2. 24 hours whenever sediment or debris is observed during activities that do not require sweeping

Remove collected material, including sediment, from paved shoulders, drain inlets, curbs and dikes, and other drainage areas. You may stockpile collected material at the job site under "Material Management" of these special provisions. If stockpiled, dispose of collected material at least once per week under "Waste Management" of these special provisions.

You may dispose of sediment within the job site collected during sweeping activities. Protect the disposal areas against erosion.

Keep dust to a minimum during street sweeping activities. Use water or a vacuum whenever dust generation is excessive or sediment pickup is ineffective.

Remove and dispose of trash collected during sweeping under "Waste Management" of these special provisions.

Dewatering

Dewatering consists of discharging accumulated stormwater, groundwater, or surface water from excavations or temporary containment facilities.

Perform dewatering work as specified for the work items involved, such as temporary active treatment system or dewatering and discharge.

If dewatering and discharging activities are not specified under a work item and you perform dewatering activities:

1. Conduct dewatering activities under the Department's Field Guide for Construction Site Dewatering.
2. Ensure that any dewatering discharge does not cause erosion, scour, or sedimentary deposits that could impact natural bedding materials.
3. Discharge the water within the project limits. If the water cannot be discharged within project limits due to site constraints or contamination, dispose of the water as directed by the Engineer.
4. Do not discharge stormwater or nonstormwater that has an odor, discoloration other than sediment, an oily sheen, or foam on the surface. Notify the Engineer immediately upon discovering any such condition.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for construction site management includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in spill prevention and control, material management, waste management, nonstormwater management, and dewatering activities, including identifying, sampling, testing, handling, and disposing of hazardous waste resulting from your activities, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as ordered by the Engineer.

10-1.05 STREET SWEEPING

GENERAL

Summary

This work includes street sweeping using machine-operated sweepers.

Street sweeping must comply with the specifications for sweeping in the Section titled, "Construction Site Management," of these special provisions except a machine-operated sweeper must be used.

Street sweeping does not void specifications for main residue collection included in other work activities, such as grooving, grinding, or asphalt concrete planing.

The SWPPP must describe and include the use of street sweeping as a water pollution control practice for sediment control and tracking control.

Submittals

At least 5 business days before you start clearing and grubbing, earthwork, or other activities with the potential for tracking sediment or debris, submit:

1. Number of machine-operated sweepers described in the SWPPP
2. Type of sweeper technology

Quality Control and Assurance

Retain and submit records of street sweeping, including:

1. Quantity of disposed sweeping waste
2. Sweeping times and locations

MATERIALS

Machine-operated sweepers must use one of the following technologies:

1. Mechanical sweeper followed by a vacuum-assisted sweeper
2. Vacuum-assisted dry (waterless) sweeper
3. Regenerative-air sweeper

CONSTRUCTION

At least 1 machine-operated sweeper must be on the job site at all times when street sweeping work is required. The sweeper must be in good working order.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for street sweeping includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in street sweeping, including disposal of collected material, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer.

10-1.06 TEMPORARY SOIL BINDER

GENERAL

Summary

This work includes applying, maintaining, and removing temporary soil binder. Soil binder uses a mixture of soil binder, and water to stabilize active and nonactive disturbed soil areas.

The SWPPP must describe and include the use of temporary soil binder as a water pollution control practice for soil stabilization.

Submittals

At least 5 business days before applying soil binder, submit:

1. Material Safety Data Sheet for the soil binder.
2. Product label describing the soil binder as an erosion control product.
3. List of pollutant indicators and potential pollutants for the use of temporary soil binder. Pollutant indicators are described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Preparation Manual.
4. Determination of acute and chronic toxicity for aquatic organisms conforming to EPA methods for the soil binder.
5. Composition of ingredients including chemical formulation.

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for soil binder:

Quality Control and Assurance

Retain and submit records of temporary soil binder applications including:

1. Compliance with specified rates
2. Application area
3. Application time
4. Quantity

MATERIALS

Soil Binder

The soil binder must be:

1. Nonflammable
2. Nontoxic to aquatic organisms
3. Free from growth or germination inhibiting factors
4. Either a plant-based product or a polymeric emulsion blend

Soil binder classified as a plant-based product must be:

1. A natural high molecular weight polysaccharide
2. A high viscosity hydrocolloid that is miscible in water
3. Functional for at least 180 days
4. Labeled as either guar, psyllium, or starch

Guar must be:

1. A guar gum based product derived from the ground endosperm of the guar plant, Cyanmopsis tetragonolobus
2. Treated with dispersant agents for easy mixing
3. Able to be diluted at the rate of 1 to 5 pounds per 100 gallons of water

Psyllium must be:

1. Made of the finely ground muciloid coating of plantago ovata or plantago ispaghula seeds
2. Able to dry and form a firm but rewettable membrane

Starch must be a non-ionic, water-soluble granular material derived from corn, potato, or other plant-based source.

Soil binder classified as a polymeric emulsion blend must be:

1. A polymeric emulsion blend with a liquid or dry powder formulation
2. Anionic with a residual monomer content that is at most 0.05 percent by weight
3. Functional for at least 180 days
4. A prepackaged product labeled as containing one of the following as the primary active ingredient of the polymeric emulsion blend:

    4.1 Acrylic copolymers and polymers
    4.2 Polymers of methacrylates and acrylates
    4.3 Copolymers of sodium acrylates and acrylamides
    4.4 Polyacrylamide (PAM) and copolymer of acrylamide
    4.5 Hydrocolloid polymers

Coloring Agent

Use a biodegradable, nontoxic coloring agent free from copper, mercury, and arsenic to ensure the hydraulic mulch contrasts with the application area.

CONSTRUCTION

Application

Apply soil binder:

1. Per the manufacturer's recommendations for the job site soil conditions. Prewet the area if recommended by the manufacturer.
2. From 2 or more directions to achieve a continuous cover.
3. During dry weather or at least 24 hours before predicted rain.

Do not apply soil binder if:

1. Water is standing on or moving across the soil surface
2. Soil is frozen
3. Air temperature is below 40 ºF during the tackifier curing period unless allowed by the manufacturer and approved by the Engineer

Do not over-spray soil binder onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

Maintenance

Reapply soil binder within 24 hours of discovering visible erosion, unless the Engineer approves a longer period.

Temporary soil binder disturbed or displaced by the Contractor's vehicles, equipment, or operations must be reapplied at the Contractor's expense.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence are not included in the cost for performing maintenance.

Removal

Remove soil binder by mechanically blending it into the soil with track laying equipment, disking, or other approved method.

MEASUREMENT AND PAYMENT

Temporary soil binder is measured by the square yard from measurements along the slope of the areas covered by the soil binder.

The contract item price paid per square yard for temporary soil binder includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying temporary soil binder, complete in place, including removal of soil binder, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The State and the Contractor share the cost of maintaining the temporary soil binder. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays to the Contractor one-half of that cost.

10-1.07 TEMPORARY COVER

GENERAL

Summary

This work includes constructing, maintaining, and removing temporary cover.

The SWPPP must describe and include the use of temporary cover as a water pollution control practice for soil stabilization.

Submittals

Submit a Certificate of Compliance as specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for:

1. Gravel-filled bag fabric
2. Temporary cover fabric

If you substitute a material in the following list, submit a sample of the alternative material for approval at least 5 business days before installation:

1. Alternative restrainer
2. Alternative linear sediment barrier

MATERIALS

Temporary Cover Fabric

The temporary cover fabric must be geosynthetic cover fabric, plastic sheeting, or a combination of both.

Temporary cover fabric must be either:

1. Plastic sheeting consisting of a single-ply geomembrane material, 10 mils thick, that complies with ASTM D 5199
2. Geosynthetic cover fabric that complies with Section 88-1.05, "Water Pollution Control," of the Standard Specifications

Gravel

Gravel for gravel-filled bags must be:

1. From 3/8 to 3/4 inch in diameter
2. Clean and free from clay balls, organic matter, and other deleterious materials

Gravel-filled Bags

Gravel-filled bags must:

1. Be made from gravel-filled bag fabric that complies with Section 88-1.05, "Water Pollution Control," of the Standard Specifications.
2. Have inside dimensions from 24 to 32 inches in length, and from 16 to 20 inches in width.
3. Have the opening bound to retain the gravel. The opening must be sewn with yarn, bound with wire, or secured with a closure device.
4. Weigh from 30 to 50 pounds when filled with gravel.

Restrainers

Restrainers must be used to secure the cover fabric or plastic sheeting to the surface of the slope.
Restrainers must be one of the following:

1. Made of gravel-filled bags that are roped together and spaced no more than 6 feet apart
2. Made of wooden lath and anchor restrainers as shown on the plans and the following:

    2.1 Wooden lath must be 2" x 4" x 8', made from fir or pine, and comply with Section 20-2.12, "Lumber," of the Standard Specifications

    2.2 Anchor restrainers must be made from steel reinforcing bars and spaced no more than 4 feet apart along the wooden lath

3. An approved alternate method

Rope

Rope must be at least 3/8 inch in diameter.
Rope must be one of the following:

1. Biodegradable, such as sisal or manila
2. Nondegradable, such as polypropelene or nylon

Linear Sediment Barrier

Linear sediment barriers consist of one or more of the following:

1. Gravel bag berm
2. Earthen berm
3. Approved alternate method

CONSTRUCTION

Temporary Cover Fabric

Install temporary cover fabric by:

1. Placing the temporary cover fabric loosely on the slope with the longitudinal edges perpendicular to the slope contours
2. Placing the temporary cover fabric on the upper portion of the slope to overlap cover fabric on the lower portion of the slope
3. Placing the temporary cover fabric on the side of the prevailing wind to overlap the cover fabric on the downwind side of the slope
4. Anchoring the perimeter edge of the temporary cover fabric in key trenches
5. Overlapping edges of the temporary cover fabric by at least 2 feet

6. Placing restrainers at the overlap area and along the toe of the slope. Between overlaps, the restrainers must be spaced a maximum of 8 feet on center.
7. Ensuring that, if anchor restraints are used, the leg of the steel reinforcing bar pierces the temporary cover fabric and holds the wooden lath firmly against the surface of the slope.

Linear Sediment Barrier

Protect excavation and embankment slopes with linear sediment barrier by:

1. Preventing run-on and concentrated flows from damaging the slopes
2. Placing the barrier approximately parallel to the slope contour at the toe of the slope
3. Angling the last 6 feet of the barrier up-slope

If earthen berms are used as a linear sediment barrier, they must be:

1. At least 8 inches high and 36 inches wide
2. Compacted by hand or mechanical method

If gravel bag berms are used as a linear sediment barrier:

1. Place gravel bags as a single layer
2. Place gravel bags end-to-end to eliminate gaps

If you need to increase the height of the gravel bag berm:

1. Increase height by adding rows of gravel-filled bags
2. Stack bags in a way that the bags in the top row overlap the joints in the lower row
3. Stabilize berm by adding rows at the bottom

If you remove the temporary cover to do other work, replace and secure temporary cover within one hour.

MAINTENANCE

Maintain temporary cover to minimize exposure of the slopes and prevent movement of the material beyond the linear sediment barrier.

Maintain temporary cover by:

1. Relocating and securing restrainers to keep the erosion control blankets in place. Temporary cover fabric that breaks free must be immediately secured.
2. Repairing or replacing the temporary cover fabric when the area covered by temporary cover becomes exposed or exhibits visible erosion.
3. Repairing or replacing the linear sediment barrier when washouts occur between joints or beneath the linear sediment barrier.
4. Repairing or replacing the temporary cover fabric when it becomes detached, torn, or unraveled.

Repair temporary cover within 24 hours of discovering damage unless the Engineer approves a longer period.

If your vehicles, equipment, or activities disturb or displace temporary cover, repair temporary cover at your expense.

REMOVAL

When the Engineer determines that temporary cover is not required, it must be removed and disposed of under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary cover must be backfilled and repaired under Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Temporary cover is measured by the square yard of the actual area covered excluding overlaps.

The contract price paid per square yard for temporary cover includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary cover,

complete in place, including restrainers and removal of temporary cover, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.08 TEMPORARY CONCRETE WASHOUTS

GENERAL

Summary

This work includes the removal and disposal of concrete waste by furnishing, maintaining, and removing temporary concrete washouts. You may use any of the following systems for temporary concrete washouts:

1. Temporary concrete washout facility
2. Portable temporary concrete washout
3. Temporary concrete washout bin

The SWPPP must describe and include the use of temporary concrete washouts as a water pollution control practice for waste management and materials pollution control.

Submittals

At least 5 business days before concrete activities start, submit:

1. Location of each concrete washout system to be used
2. Name and location of the off-site concrete waste disposal plant licensed to receive the solid concrete waste, liquid concrete waste, or both
3. Copy of the permit issued by the RWQCB for the off-site commercial disposal plant
4. Copy of the permit issued by the state or local agency having jurisdiction over the disposal plant if the disposal site is located outside of the State

Retain and submit records of disposed concrete waste.
Submit a certificate of compliance for:

1. Gravel-filled bag
2. Plastic liner

MATERIALS

General

The sign for a concrete washout must comply with section 12-3.06B, "Portable Signs," of the Standard Specifications except the sign panel may be plywood. The sign panel must be at least 2' x 4' in size. The sign legend must read "Concrete Washout" in 6-inch high black letters on a white background.

Temporary Concrete Washout Facility

A temporary concrete washout facility must be constructed to be a watertight container with enough capacity to contain all liquid and concrete waste generated by washout activities without seepage or spills.
Stakes may be either wood or metal and must comply with one of the following:

1. Wood stakes must be:

    1.1. Untreated fir, redwood, cedar, or pine and cut from sound timber
    1.2. Straight and free of loose or unsound knots and other defects which would render stakes unfit for use
    1.3. Pointed on the end to be driven into the ground
    1.4. At least 2" x 2" x 48" in size

2. Metal stakes must be at least 0.5-inch diameter and 48 inches long. Tops of metal stakes must be bent at a 90-degree angle or capped with an orange or red plastic safety cap that fits snugly to the metal stake.

Straw bales must comply with Section 20-2.06, "Straw," of the Standard Specifications and be:

1. At least 14 inches wide, 18 inches high, 36 inches long, and weigh at least 50 pounds.
2. Composed entirely of vegetative matter, except for binding material.

3. Bound by wire, nylon, or polypropylene string. Do not use jute or cotton binding. Baling wire must be minimum 16 gauge. Nylon or polypropylene string must be approximately 0.08-inch in diameter with 80 pounds of breaking strength.

Gravel-filled bag fabric must comply with Section 88-1.05, "Water Pollution Control," of the Standard Specifications.

Gravel for gravel-filled bags must be:

1. 3/8 to 3/4 inch in diameter
2. Clean and free of clay balls, organic matter, and other deleterious materials

Gravel-filled bag must:

1. Be made of gravel-filled bag fabric.
2. Have inside dimensions from 24 to 32 inches long, and from 16 to 20 inches wide.
3. Have bound opening to retain gravel. Opening must be sewn with yarn, bound with wire, or secured with a closure device.
4. Weigh from 30 to 50 pounds when filled with gravel.

The plastic liner for a temporary concrete washout facility must be:

1. Single ply, new polyethylene sheeting, without seams or overlapping joints
2. At least 10 mils thick
3. Free of holes, punctures, tears, or other defects

Portable Temporary Concrete Washout

A portable temporary concrete washout must be a commercially available, watertight container with enough capacity to contain all liquid and concrete waste generated by washout activities without seepage or spills and be:

1. At least 55 gallons in capacity.
2. Labeled for exclusive use as a concrete waste and washout facility. Stencil "Concrete Waste Material" in 3-inch high black letters on white background where the top of stenciling is 12 inches from the top of the container.

Temporary Concrete Washout Bin

A temporary concrete washout bin must be a commercially available, watertight container with enough capacity to contain all liquid and concrete waste generated by washout activities without seepage or spills and be:

1. At least 5 cubic yards in capacity
2. Roll-off type with or without folding steel ramps
3. Labeled for exclusive use as a concrete waste and washout facility

CONSTRUCTION

Place temporary concrete washout at the job site:

1. Before concrete placement activities start
2. In the immediate area of concrete work where authorized
3. No closer than 50 feet from storm drain inlets, open drainage facilities, ESAs, and watercourses
4. Away from traffic or public access areas

Install a concrete washout sign adjacent to each concrete washout location.

Use concrete washout to collect:

1. Washout from concrete delivery trucks
2. Slurries containing PCC or HMA from sawcutting, coring, grinding, grooving, and hydro-concrete demolition
3. Concrete waste from mortar mixing stations

Do not fill a concrete washout higher than 6 inches below the upper rim.

Remove and dispose of concrete waste within 2 business days after a concrete washout becomes filled. Dispose of concrete waste material at the designated off-site concrete waste disposal plant.

Relocate a portable temporary concrete washout or bin as needed for concrete work.

The Department does not pay for relocating a portable temporary concrete washout or bin.

Secure a portable temporary concrete washout or bin to prevent spilling of concrete waste material whenever it is being relocated or transported within the job site. Whenever any spilled material is observed, clean up the spilled material and place it back into the concrete washout unit.

PAYMENT

The contract lump sum price paid for temporary concrete washout includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in the removal and disposal of concrete waste and furnishing, maintaining, and removing the temporary concrete washout, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.09 TEMPORARY CONSTRUCTION ENTRANCE

GENERAL

Summary

This work includes constructing, maintaining, and removing temporary construction entrance to provide temporary access.

The SWPPP must describe and include the use of temporary construction entrance as a water pollution control practice for tracking control.

Temporary construction entrance must be Type 1, Type 2, or a combination.

Submittals

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for:

1. Temporary entrance fabric
2. Rock

Submit details for alternatives at least 5 business days before installation. You may propose alternatives for the following items:

1. Alternative sump
2. Alternative corrugated steel panels

If the Engineer approves, you may eliminate the sump.

MATERIALS

Temporary Entrance Fabric

Temporary entrance fabric must comply with the specifications for rock slope protection fabric (Class 8) in Section 88-1.06, "Channel and Shore Protection," of the Standard Specifications.

Rock

Rock must be Type A or Type B.

Rock (Type A) must comply with:

1. Requirements under Section 72-2.02, "Materials," of the Standard Specifications
2. Following sizes:

Square Screen Size (inch)	Percentage Passing	Percentage Retained
6	100	0
3	0	100

Rock (Type B) must be Railway Ballast Number 25. Do not use blast furnace slag. Railway Ballast Number 25 must comply with:

1. Description in AREMA Manual for Railway Engineering.
2. Following sizes:

Nominal Size Square Opening	Percentage Passing								
	3"	2-1/2"	2"	1-1/2"	1"	3/4"	1/2"	3/8"	No. 4
2-1/2"-3/8"	100	80-100	60-85	50-70	25-50	-	5-20	0-10	0-3

3. Following properties:

Specification	Requirements
Percent material passing No. 200 sieve, max. ASTM: C 117	1.0
Bulk specific gravity, min. ASTM: C 127	2.60
Absorption, percent min. ASTM: C 127	1.0
Clay lumps and friable particles, percent max. ASTM: C 142	0.5
Degradation, percent max. ASTM: C 535	30
Soundness (Sodium Sulfate), percent max. ASTM: C 88	5.0
Flat, elongated particles, or both, percent max. ASTM: D 4791	5.0

Corrugated Steel Panels

Corrugated steel panels must:

1. Be made of steel.
2. Be pressed or shop welded
3. Have a slot or hook for connecting panels together

CONSTRUCTION

Prepare location for temporary construction entrance by:

1. Removing vegetation to ground level and clear away debris
2. Grading ground to uniform plane
3. Grading ground surface to drain
4. Removing sharp objects that may damage fabric
5. Compacting the top 1.5 feet of soil to at least 90 percent relative compaction

If temporary entrance (Type 1) is specified, use rock (Type A).

If temporary construction entrance (Type 2) is specified, use Rock (Type B) under corrugated steel panels. Use at least 6 corrugated steel panels for each entrance. Couple panels together.

Install temporary construction entrance by:

1. Positioning fabric along the length of the entrance
2. Overlapping sides and ends of fabric by at least 12 inches
3. Spreading rock over fabric in the direction of traffic
4. Covering fabric with rock within 24 hours
5. Keeping a 6 inch layer of rock over fabric to prevent damage to fabric by spreading equipment

Do not drive on fabric until rock is spread.

Unless the Engineer eliminates the sump, install a sump within 20 feet of each temporary construction entrance.

Repair fabric damaged during rock spreading by placing a new fabric over the damaged area. New fabric must be large enough to cover damaged area and provide at least 18-inch overlap on all edges.

Maintenance

Maintain temporary construction entrance to minimize generation of dust and tracking of soil and sediment onto public roads. If dust or sediment tracking increases, place additional rock unless the Engineer approves another method.

Repair temporary construction entrance if:

1. Fabric is exposed
2. Depressions in the entrance surface develop
3. Rock is displaced

Repair temporary construction entrance within 24 hours of discovering damage unless the Engineer approves a longer period.

During use of temporary construction entrance, do not allow soil, sediment, or other debris tracked onto pavement to enter storm drains, open drainage facilities, or watercourses. When material is tracked onto pavement, remove it within 24 hours unless the Engineer approves a longer period.

If your vehicles, equipment, or activities disturb or displace the temporary construction entrance, repair it at your expense.

The Department does not pay maintenance costs for cleanup, repair, removal, disposal, or replacement due to improper installation or your negligence.

Removal

When the Engineer determines that temporary construction entrance is not required, remove and dispose of it under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Backfill and repair ground disturbance, including holes and depressions, caused by installation and removal of temporary construction entrance under Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Temporary construction entrance is determined from actual count in place. Temporary construction entrance is measured one time only and no additional measurement will be recognized.

The contract price paid for temporary construction entrance includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing temporary construction entrance, complete in place, including removal of temporary construction entrance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No additional compensation will be made if the temporary construction entrance is relocated during the course of construction.

The State and you share the cost of maintaining temporary construction entrance. The State determines the maintenance cost under Section 9-1.03, "Force Account Payment," of the Standard Specifications and pays you one-half of that cost.

10-1.10 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

SUMMARY

Comply with Section 8-1.04, "Progress Schedule," of the Standard Specifications except you must use computer software to prepare the schedule.

You are responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

DEFINITIONS

contract completion date: Current extended date for completion of the contract shown on the Weekly Statement of Working Days furnished by the Engineer as specified in Section 8-1.06, "Time of Completion," of the Standard Specifications.

data date: Day after the date through which a schedule is current. Everything occurring earlier than the data date is as-built and everything on or after the data date is planned.

early completion time: Difference in time between an early scheduled completion date and the contract completion date.

float: Difference between the earliest and latest allowable start or finish times for an activity.

milestone: Event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.

narrative report: Document submitted with each schedule that discusses topics related to project progress and scheduling.

near critical path: Chain of activities with total float exceeding that of the critical path but having no more than 10 working days of total float.

State-owned float activity: Activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.

time impact analysis: Schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.

time-scaled network diagram: Graphic depiction of a CPM schedule comprised of activity bars with relationships for each activity represented by arrows. The tail of each arrow connects to the activity bar for the predecessor and points to the successor.

total float: Amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.

GENERAL REQUIREMENTS

Submit baseline, monthly updated, and final updated schedules, each consistent in all respects with the time and order of work requirements of the contract. Perform work in the sequence indicated on the current accepted schedule.

Each schedule must show:

1. Calculations using the critical path method to determine controlling activities.
2. Duration activities less than 20 working days.
3. At least 50 but not more than 500 activities, unless authorized. The number of activities must be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.
4. Each required constraint. Constraints other than those required by the special provisions may be included only if authorized.
5. State-owned float as the predecessor activity to the scheduled completion date.
6. Activities with identification codes for responsibility, stage, work shifts, location, and contract pay item numbers.

You may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time is considered a resource for your exclusive use. You may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently, or by completing activities earlier than planned. You may also submit for approval a VECP as specified in Section 4-1.035B, "Value Engineering Change Proposal." of the Standard Specifications that will reduce time of construction.

You may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. Provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float is considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. Prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action as specified in "Time Impact Analysis." The Engineer documents State-owned float by directing you to update the State-owned float activity on the next updated schedule. Include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present, or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date as specified in Section 4-1.03, "Changes," of the Standard Specifications. Prepare a time impact analysis to determine the effect of the change as specified in "Time Impact Analysis" and include the impacts acceptable to the Engineer in the next updated schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed 1 or more working days because of the ordered change.

The Engineer's review and acceptance of schedules does not waive any contract requirements and does not relieve you of any obligation or responsibility for submitting complete and accurate information. Correct rejected schedules and resubmit them within 7 days of notification by the Engineer, at which time a new review period of 7 days will begin.

Errors or omissions on schedules do not relieve you from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either you or the Engineer discover that any aspect of the schedule has an error or omission, you must correct it on the next updated schedule.

COMPUTER SOFTWARE

Submit a description of your proposed schedule software for authorization. All software must be compatible with the current version of the Windows operating system in use by the Engineer. The schedule software must include the latest version of Oracle Primavera P6 Professional Project Management for Windows, or equivalent.

If schedule software equivalent to P6 is proposed, it must be capable of:

1. Generating files that can be imported into P6
2. Comparing 2 schedules and providing reports of changes in activity ID, activity description, constraints, calendar assignments, durations, and logic ties

NETWORK DIAGRAMS, REPORTS, AND DATA

Include the following with each schedule submittal:

1. 2 sets of originally plotted, time-scaled network diagrams
2. 2 copies of a narrative report
3. 1 read-only compact disk or floppy diskette containing the schedule data

The time-scaled network diagrams must conform to the following:

1. Show a continuous flow of information from left to right
2. Be based on early start and early finish dates of activities
3. Clearly show the primary paths of criticality using graphical presentation
4. Be prepared on 34" x 44"
5. Include a title block and a timeline on each page

The narrative report must be organized in the following sequence with all applicable documents included:

1. Transmittal letter
2. Work completed during the period
3. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours
4. Description of the current critical path
5. Changes to the critical path and scheduled completion date since the last schedule submittal
6. Description of problem areas
7. Current and anticipated delays:

    7.1. Cause of delay
    7.2. Impact of delay on other activities, milestones, and completion dates
    7.3. Corrective action and schedule adjustments to correct the delay

8. Pending items and status thereof:

    8.1. Permits
    8.2. Change orders
    8.3. Time adjustments
    8.4. Noncompliance notices

9. Reasons for an early or late scheduled completion date in comparison to the contract completion date

Schedule submittals will only be considered complete when all documents and data have been submitted as described above.

PRECONSTRUCTION SCHEDULING CONFERENCE

Schedule a preconstruction scheduling conference with your project manager and the Engineer within 15 days after contract approval. The Engineer will conduct the meeting and review the requirements of this section with you.

Submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of this section. If you propose deviations to the construction staging, then the general time-scaled logic diagram must also display the deviations and resulting time impacts. Be prepared to discuss the proposal.

At this meeting, also submit the alphanumeric coding structure and activity identification system for labeling work activities. To easily identify relationships, each activity description must indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor, or mainline.

The Engineer reviews the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to you for implementation.

BASELINE SCHEDULE

Beginning the week following the preconstruction scheduling conference, meet with the Engineer weekly to discuss schedule development and resolve schedule issues until the baseline schedule is accepted.

Submit a baseline schedule within 20 days of contract approval. Allow 20 days for the Engineer's review after the baseline schedule and all support data are submitted.

The baseline schedule must include the entire scope of work and how you plan to complete all work contemplated. The baseline schedule must show the activities that define the critical path. Multiple critical paths and near-critical paths must be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities must be critical or near critical, unless otherwise authorized.

The baseline schedule must not extend beyond the number of contract working days. The baseline schedule must have a data date of contract approval. If you start work before contract approval, the baseline schedule must have a data date of the 1st day you performed work at the job site.

If you submit an early completion baseline schedule that shows contract completion in less than 85 percent of the contract working days, the baseline schedule must be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations must be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for you and your subcontractors. Use average composite crews to display the labor loading of on-site construction activities. Optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms must show labor crafts and equipment classes to be used. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

UPDATED SCHEDULE

Submit an updated schedule and meet with the Engineer to review contract progress, on or before the 1st day of each month, beginning 1 month after the baseline schedule is accepted. Allow 15 days for the Engineer's review after the updated schedule and all support data are submitted, except that the review period will not start until the previous month's required schedule is accepted. Updated schedules that are not accepted or rejected within the review period are considered accepted by the Engineer.

The updated schedule must have a data date of the 21st day of the month or other date established by the Engineer. The updated schedule must show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete, and finish dates must be shown as applicable. Durations for work that has been completed must be shown on the updated schedule as the work actually occurred, including Engineer submittal review and your resubmittal times.

You may include modifications such as adding or deleting activities or changing activity constraints, durations, or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule. Justify in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then submit a time impact analysis as specified in this section.

TIME IMPACT ANALYSIS

Submit a written time impact analysis (TIA) with each request for adjustment of contract time, or when you or the Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA must illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis must use the accepted schedule that has a data date closest to and before the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions before the event, the accepted schedule must be updated to the day before the event being analyzed. The TIA must include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules must be equal to the adjustment of contract time. The Engineer may construct and use an appropriate project schedule or other recognized method to determine adjustments in contract time until you provide the TIA.

Submit 2 copies of your TIA within 20 days of receiving a written request for a TIA from the Engineer. Allow the Engineer 15 days after receipt to review the submitted TIA. All approved TIA schedule changes must be shown on the next updated schedule.

If a TIA you submit is rejected, meet with the Engineer to discuss and resolve issues related to the TIA. If clarification is still needed, you are allowed 15 days to submit a protest as specified in Section 5-1.011, "Protests," of the Standard Specifications. If agreement is not reached, you are allowed 5 days from the date you receive the Engineer's response to your protest to submit an Initial Potential Claim Record as specified in Section 5-1.146B, "Initial Potential Claim Record," of the Standard Specifications. Only show actual as-built work, not unapproved changes related to the TIA, in subsequent updated schedules. If agreement is reached at a later date, approved TIA schedule changes must be shown on the next updated schedule. The Engineer withholds remaining payment on the schedule bid item if a TIA is requested and not submitted within 20 days. The schedule item payment resumes on the next estimate after the requested TIA is submitted. No other contract payment is withheld regarding TIA submittals.

FINAL UPDATED SCHEDULE

Submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. Provide a written certificate with this submittal signed by your project manager or an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

PAYMENT

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) includes full compensation for furnishing all labor, material, tools, equipment, and incidentals, and for doing all the work involved in preparing, furnishing, and updating schedules, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) bid item will be made progressively as follows:

1. A total of 25 percent of the item amount will be paid upon achieving all of the following:

    1.1. Completion of 5 percent of all contract item work.
    1.2. Acceptance of all schedules and approval of all TIAs required to the time when 5 percent of all contract item work is complete.

2. A total of 50 percent of the item amount will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 25 percent of all contract item work is complete.
3. A total of 75 percent of the item amount will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and approval of all TIAs required to the time when 50 percent of all contract item work is complete.
4. A total of 100 percent of the item amount will be paid upon completion of all contract item work, acceptance of all schedules and approval of all TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If you fail to complete any of the work or provide any of the schedules required by this section, the Engineer makes an adjustment in compensation as specified in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in submitting schedules.

10-1.11 TIME-RELATED OVERHEAD

The Contractor will be compensated for time-related overhead as described below and in conformance with "Force Account Payment" of these special provisions. The Contractor will not be compensated for time-related overhead for delays to the controlling operations caused by the Engineer that occur prior to the first working day, but will be compensated for actual overhead costs incurred, as determined by an independent Certified Public Accountant audit examination and report.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages," "Force Account Payment," and "Progress Schedule (Critical Path Method)" of these special provisions.

The provisions in Section 9-1.08D(2)(b), "Overhead Claims," of the Standard Specifications shall not apply.

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract. Time-related overhead shall not apply to subcontractors of any tier, suppliers, fabricators, manufacturers, or other parties associated with the Contractor.

Field office overhead expenses include time-related costs associated with the normal and recurring operations of the construction project, and shall not include costs directly attributable to the work of the contract. Time-related costs of field office overhead include, but are not limited to, salaries, benefits, and equipment costs of project managers, general superintendents, field office managers and other field office staff assigned to the project, and rent, utilities, maintenance, security, supplies, and equipment costs of the project field office.

Home office overhead or general and administrative expenses refer to the fixed costs of operating the Contractor's business. These costs include, but are not limited to, general administration, insurance, personnel and subcontract administration, purchasing, accounting, and project engineering and estimating. Home office overhead costs shall exclude expenses specifically related to other contracts or other businesses of the Contractor, equipment coordination, material deliveries, and consultant and legal fees.

The quantity of time-related overhead associated with a reduction in contract time for an accepted VECP under Section 4-1.035B, "Value Engineering Change Proposal," of the Standard Specifications shall be considered a construction cost attributable to the resultant estimated net savings due to the cost reduction incentive.

If the final increased quantity of time-related overhead exceeds 149 percent of the number of working days specified in the verified Bid Item List, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.

Independent Certified Public Accountant's audit examinations shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. Audit examinations and reports shall determine if the rates of field office overhead and home office overhead are:

A. Allowable in conformance with the requirements of the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.
B. Adequately supported by reliable documentation.
C. Related solely to the project under examination.

Within 20 days of receipt of the Engineer's written request, the Contractor shall make its financial records available for audit by the State for the purpose of verifying the actual rate of time-related overhead specified in the audit submitted by the Contractor. The actual rate of time-related overhead specified in the audit, submitted by the Contractor, will be subject to approval by the Engineer.

If the Engineer requests the independent Certified Public Accountant audit, or if it is requested in writing by the Contractor, the contract item payment rate for time-related overhead, in excess of 149 percent of the number of working days specified in the verified Bid Item List, will be adjusted to reflect the actual rate.

The cost of performing an independent Certified Public Accountant audit examination and submitting the report, requested by the Engineer, will be borne equally by the State and the Contractor. The division of the cost will be made by determining the cost of providing an audit examination and report in conformance with the

provisions of Section 9-1.04, "Extra Work Performed by Specialists," of the Standard Specifications, and paying to the Contractor one-half of that cost. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report for overhead claims other than for the purpose of verifying the actual rate of time-related overhead shall be entirely borne by the Contractor. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report to verify actual overhead costs incurred prior to the first working day shall be entirely borne by the Contractor.

The quantity of time-related overhead to be paid will be measured by the working day, designated in the verified Bid Item List as WDAY. The estimated number of working days is the number of working days, excluding days for plant establishment, as specified in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions. The quantity of time-related overhead will be increased or decreased only as a result of suspensions or adjustments of contract time which revise the current contract completion date, and which satisfy any of the following criteria:

A. Suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:

    1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.
    2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
    3. Suspensions ordered due to factors beyond the control of and not caused by the State or the Contractor, for which the Contractor is granted non-working days.
    4. Other suspensions that mutually benefit the State and the Contractor.

B. Adjustments of contract time granted by the State set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

A delay to the controlling operation may be concurrent and any of the following:

1. Nonexcusable: A nonexcusable delay is caused by the fault, nonperformance, or deficiency of the Contractor, subcontractors of any tier, or suppliers. The days during a nonexcusable delay are working days. No time or payment adjustment for a nonexcusable delay is allowed.
2. Excusable: An excusable delay is caused by factors beyond the control and without the fault of the State or the Contractor. The days during an excusable delay are non-working days.
3. Compensable: A compensable delay is caused solely by the fault, deficiency, error, omission, or change made by the State. A time adjustment and a payment adjustment for the actual cost without markup or profit are allowed.

A concurrent delay occurs when 2 or more separate delays overlap partially or entirely. A nonexcusable delay concurrent with either an excusable or a compensable delay is a nonexcusable delay. An excusable delay concurrent with a compensable delay is an excusable delay.

The quantity of time-related overhead is only adjusted as a result of a compensable delay and is not adjusted as a result of either a nonexcusable or an excusable delay.

An approved time impact analysis submitted as specified in "Progress Schedule (Critical Path Method)" of these special provisions is used to determine the type and duration of a delay.

In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule.

The contract price paid per working day for time-related overhead shall include full compensation for time-related overhead, including the Contractor's share of costs of the independent Certified Public Accountant audit of overhead costs requested by the Engineer, as specified in these special provisions, and as directed by the Engineer.

The provisions in Sections 4-1.03B, "Increased or Decreased Quantities," and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications shall not apply to the contract item of time-related overhead.

Full compensation for additional overhead costs involved in incentive and disincentive provisions to satisfy internal milestone or multiple calendar requirements shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs incurred during days of inclement weather when the contract work is extended into additional construction seasons due to delays caused by the State shall be considered as included in the time-related overhead paid during the contract working days, and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs involved in performing additional contract item work that is not a controlling operation shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for overhead, other than time-related overhead measured and paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions, shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

Overhead costs incurred by subcontractors of any tier, suppliers, fabricators, manufacturers, and other parties associated with the Contractor shall be considered as included in the various items of work and as specified in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

For the purpose of making progress payments pursuant to the provisions in Section 9-1.07, "Progress Payments," of the Standard Specifications, the number of working days to be paid for time-related overhead in each monthly partial payment will be the number of working days, specified above to be measured for payment that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to extra work or changes in character of the work, will be paid for upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

A. The contract item price.
B. Twenty percent of the original total contract amount divided by the number of working days specified in "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions.

After the work has been completed, except plant establishment work, as provided in Section 20-4.08, "Plant Establishment Work," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid will be included for payment in the first estimate made after completion of roadway construction work, in conformance with the provisions in Section 9-1.07, "Progress Payments," of the Standard Specifications.

10-1.12 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Flagging, signs, and temporary traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Category 1 temporary traffic control devices are defined as small and lightweight (less than 100 pounds) devices. These devices shall be certified as crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 temporary traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 temporary traffic control devices at least 5 business days before beginning any work using the devices or within 2 business days after the request if the devices are already in use. Self-certification shall be provided by the manufacturer or Contractor and shall include the following:

A. Date,
B. Federal Aid number (if applicable),
C. Contract number, district, county, route and post mile of project limits,
D. Company name of certifying vendor, street address, city, state and zip code,
E. Printed name, signature and title of certifying person; and
F. Category 1 temporary traffic control devices that will be used on the project.

The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 temporary traffic control devices are defined as small and lightweight (less than 100 pounds) devices that are not expected to produce significant vehicular velocity change, but may cause potential harm to impacting vehicles. Category 2 temporary traffic control devices include barricades and portable sign supports.

Category 2 temporary traffic control devices shall be on the Federal Highway Administration's (FHWA) list of Acceptable Crashworthy Category 2 Hardware for Work Zones. This list is maintained by FHWA and can be located at:

http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/listing.cfm?code=workzone

The Department also maintains this list at:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf/Category2.pdf

Category 2 temporary traffic control devices that have not received FHWA acceptance shall not be used. Category 2 temporary traffic control devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer. The label shall be readable and permanently affixed by the manufacturer. Category 2 temporary traffic control devices without a label shall not be used.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 temporary traffic control devices to be used on the project at least 5 business days before beginning any work using the devices or within 2 business days after the request if the devices are already in use.

Category 3 temporary traffic control devices consist of temporary traffic-handling equipment and devices that weigh 100 pounds or more and are expected to produce significant vehicular velocity change to impacting vehicles. Temporary traffic-handling equipment and devices include crash cushions, truck-mounted attenuators, temporary railing, temporary barrier, and end treatments for temporary railing and barrier.

Type III barricades may be used as sign supports if the barricades have been successfully crash tested, meeting the NCHRP Report 350 criteria, as one unit with a construction area sign attached.

Category 3 temporary traffic control devices shall be shown on the plans or on the Department's Highway Safety Features list. This list is maintained by the Division of Engineering Services and can be found at:

http://www.dot.ca.gov/hq/esc/approved_products_list/

Category 3 temporary traffic control devices that are not shown on the plans or not listed on the Department's Highway Safety Features list shall not be used.

Full compensation for providing self-certification for crashworthiness of Category 1 temporary traffic control devices and for providing a list of Category 2 temporary traffic control devices used on the project shall be considered as included in the prices paid for the various items of work requiring the use of the Category 1 or Category 2 temporary traffic control devices and no additional compensation will be allowed therefor.

10-1.13 CONSTRUCTION AREA SIGNS

Construction area signs for temporary traffic control shall be furnished, installed, maintained, and removed when no longer required in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Furnish Sign" of these special provisions.

Attention is directed to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels. Type III, IV, VII, VIII, or IX retroreflective sheeting shall be used for stationary mounted construction area sign panels.

Attention is directed to "Construction Project Information Signs" of these special provisions regarding the number and type of construction project information signs to be furnished, erected, maintained, and removed and disposed of.

Unless otherwise shown on the plans or specified in these special provisions, the color of construction area warning and guide signs shall have black legend and border on orange background, except W10-1 or W47(CA) (Highway-Rail Grade Crossing Advance Warning) sign shall have black legend and border on yellow background.

Repair to construction area sign panels will not be allowed, except when approved by the Engineer. At nighttime under vehicular headlight illumination, sign panels that exhibit irregular luminance, shadowing or dark blotches shall be immediately replaced at the Contractor's expense.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 business days, but not more than 14 days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert	811

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes. The post hole diameter, if backfilled with portland cement concrete, shall be at least 4 inches greater than the longer dimension of the post cross section.

Construction area signs placed within 15 feet from the edge of the travel way shall be mounted on stationary mounted sign supports as specified in "Construction Area Traffic Control Devices" of these special provisions.

The Contractor shall maintain accurate information on construction area signs. Signs that are no longer required shall be immediately covered or removed. Signs that convey inaccurate information shall be immediately replaced or the information shall be corrected. Covers shall be replaced when they no longer cover the signs properly. The Contractor shall immediately restore to the original position and location any sign that is displaced or overturned, from any cause, during the progress of work.

10-1.14 MAINTAINING TRAFFIC

Maintaining traffic shall conform to the provisions in Sections 7-1.08, "Public Convenience," Section 7-1.09, "Public Safety," and Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Closure is defined as the closure of a traffic lane or lanes, including shoulder, within a single traffic control system.

Closures shall conform to the provisions in "Traffic Control System for Lane Closure" of these special provisions.

Work that interferes with public traffic shall be limited to the hours when lane closures are allowed, except for work required under Sections 7-1.08, "Public Convenience," and Section 7-1.09, "Public Safety."

The full width of the traveled way shall be open for use by public traffic as shown in the table "Lane Closure Restriction for Designated Legal Holidays and Special Days" included in this section, "Maintaining Traffic."

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday.

Special days are: Martin Luther King Jr. Day, Cesar Chavez Day, Good Friday thru Easter Sunday, Day after Thanksgiving, December 26 thru January 2.

The closure starts with the first cone down and ends with the last cone picked up. No closure sign(s) shall be exposed to traffic more than 30 minutes before or after a closure, except as otherwise indicated in the special provisions.

Under one-way reversing traffic control operations, public traffic may be stopped in one direction for periods not to exceed 15 minutes. After each stoppage, all accumulated traffic for that direction shall pass through the work zone before another stoppage is made.

The maximum length of a single stationary lane closure shall be 2 miles.

Not more than 1 separate stationary lane closures will be allowed in each direction of travel at one time. Concurrent stationary closures shall be spaced no closer than 1.25 miles apart and closures shall be along the same lane/s.

Freeways may be closed only if signed for closing 7 days in advance. The Contractor shall notify the Engineer not less than 5 business days prior to signing the freeway. If the freeway is not closed on the posted day, the closure shall be changed to allow a 3-business-day advance notice before closure.

Freeway closure charts are for the placement of overhead sign bridges.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way or shoulders including sections closed to public traffic.

When work vehicles or equipment are parked within 6 feet of a traffic lane to perform active construction, the shoulder area shall be closed as shown on the plans.

If minor deviations from the lane requirement charts are required, a written request shall be submitted to the Engineer at least 15 days before the proposed date of the closure. The Engineer may approve the deviations if there is no significant increase in the cost to the State and if the work can be expedited and better serve the public traffic.

Lane Closure Restriction for Designated Legal Holidays and Special Days

Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun
x	**H** xx	xx	xx	xxx						
	SD xx									
x	xx	**H** xx	xx	xxx						
		SD xx								
	x	xx	**H** xx	xx						
			SD xx							
	x	xx	xx	**H** xx	xxx					
	x	xx	xx	**SD** xx						
				x	**H** xx					
				x	**SD** xx					
					x	**H** xx	xxx			
						SD xx				
				xxx		x	**H** xx	xx	xx	xx
							SD xx			

Legends:

	Refer to lane closure charts
x	The full width of the traveled way shall be open for use by public traffic after 0600.
xx	The full width of the traveled way shall be open for use by public traffic.
xxx	The full width of the traveled way shall be open for use by public traffic until 1800.
H	Designated Legal Holiday
SD	Special Day

District 8 Special Events List

No work that encroaches onto the traveled way of the affected Routes shall be allowed from 3 hours before to 2 hours following special events listed below unless otherwise permitted by the District Traffic Manager

Venue/Special Event	Affected Routes	Route Impact	Route Limits	Presently Identified The Month Of Events	Website	Contact #
Glen Helen Hyundai Pavilion	215 15	*** **	University Pkwy to I-15/215 connector I-60 to Devore Road	Various events May-Oct yearly See web site	www.hyundaipavilion.com	909-880-6500
Route 66 Rendezvous	215	***	Mill St. to 5th St	September	www.route-66.org	909-889-3980
California Speedway	10 15 210 66 60	*** *** *** *** ***	LA I-57 to SBD I-215 I-15/215 to SR-91 Haven to I-215 Haven to Cherry I-15 to County Line	Various events Through the year See web site	www.californiaspeedway.com	909-429-5000
Temecula Balloon and Wine Festival	15	**	SR-79 (Winchester Rd.) and Rancho California	June	www.tvbwf.com	951-676-6713
Bob Hope/Chrysler Classic	10	**	Palm Springs off ramp at SR-111	January	www.bhcc.com	760-346-6329
Kraft Nabisco Championship	10	**	Palm Springs off ramp at SR-111	March	www.nabiscochampionship.com	760-324-4546
Festival of Lights (Downtown Riverside)	91	**	I-15 to I-215/SR-60 split	November	www.riversidedowntown.org	951-683-7100
March Air Show March Air Reserve Base	215	***	Cactus to Ramona Express Way	May	www.marchfieldairfest.com/	951-655-1110
UCR Graduation	60 215	*** ***	I-215/SR-60/SR-91 split to Central Ave.	June	www.commencement.ucr.edu	951-787-3144
Laughlin River Run	40	***	I-40/ From I-15 to Arizona State Line	April	www.laughlinriverrun.com/	949-502-3434
Thunder & Lightning Powwow	10	***	I-10/ Morongo Valley	September	www.morongocasinoresort.com/pow3.cfm	800-252-4499 ext.# 23800

Note: The dates of events change yearly. Contact numbers and websites provided to verify exact dates

** Designates-Moderate Impact (20 minute delay or less)
*** Designates-High Impact (30 minute delay or less)

Chart No. 1
Freeway/Expressway Lane Requirements

County: sbd	Route/Direction: 15/sb	PM: 177.3/181.1

Closure Limits:

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays																			1	1	1	1	1	1	
Tuesday through Thursdays	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	
Fridays	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2								
Saturdays																									
Sundays																									

Legend:

1	Provide at least one through freeway lane open in direction of travel
2	Provide at least two adjacent through freeway lanes open in direction of travel
	Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

Chart No. 2
Complete Freeway/Expressway Closure Hours

County: SBD	Route/Direction: 15 SB	PM:177.3/181.1

Closure Limits:

FROM HOUR TO HOUR	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Tuesday or Wednesday or Thursday		C	C	C																					
Fridays																									
Saturdays																									
Sundays																									

Legend:

C	Freeway or expressway may be closed completely.
	No complete freeway or expressway closure is permitted.

REMARKS: A Full freeway closure is allowed only one time for the duration of this project.

10-1.15 CLOSURE REQUIREMENTS AND CONDITIONS

Closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

CLOSURE SCHEDULE

A written schedule of planned closures for the next week period, defined as Sunday noon through the following Sunday noon, shall be submitted by noon each Monday. A written schedule shall be submitted not less than 25 days and not more than 125 days before the anticipated start of any operation that will:

1. Reduce horizontal clearances, traveled way, including shoulders, to two lanes or less due to such operations as temporary barrier placement and paving
2. Reduce the vertical clearances available to the public due to such operations as pavement overlay, overhead sign installation, or falsework or girder erection

The Closure Schedule shall show the locations and times of the proposed closures. The Closure Schedule request forms furnished by the Engineer shall be used. Closure Schedules submitted to the Engineer with incomplete or inaccurate information will be rejected and returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

Closure Schedule amendments, including adding additional closures, shall be submitted by noon to the Engineer, in writing, at least 3 business days in advance of a planned closure. Approval of Closure Schedule amendments will be at the discretion of the Engineer.

The Engineer shall be notified of cancelled closures 2 business days before the date of closure.

Closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer.

CONTINGENCY PLAN

A detailed contingency plan shall be prepared for reopening closures to public traffic. If required by "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, the contingency plan shall be submitted to the Engineer before work at the job site begins. Otherwise, the contingency plan shall be submitted to the Engineer within one business day of the Engineer's request.

LATE REOPENING OF CLOSURES

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. No further closures are to be made until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 business days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to compensation for the suspension of work resulting from the late reopening of closures.

COMPENSATION

The Engineer shall be notified of delays in the Contractor's operations due to the following conditions, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of those conditions, and the Contractor's loss due to that delay could not have been avoided by rescheduling the affected closure or by judicious handling of forces, equipment and plant, the delay will be considered a right of way delay and will be compensated in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications:

1. The Contractor's proposed Closure Schedule is denied and his planned closures are within the time frame allowed for closures in "Maintaining Traffic" of these special provisions, except that the Contractor will not be entitled to compensation for amendments to the Closure Schedule that are not approved.
2. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure before the time designated in the approved Closure Schedule, delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

10-1.16 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, the provisions under "Maintaining Traffic" and "Construction Area Signs" of these special provisions, and these special provisions.

The provisions in this section will not relieve the Contractor of responsibility for providing additional devices or taking measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

During traffic stripe operations and pavement marker placement operations using bituminous adhesive, traffic shall be controlled, at the option of the Contractor, with either stationary or moving lane closures. During other operations, traffic shall be controlled with stationary lane closures. Attention is directed to the provisions in Section 84-1.04, "Protection From Damage," and Section 85-1.06, "Placement," of the Standard Specifications.

If components in the traffic control system are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

STATIONARY LANE CLOSURE

When lane closures are made for work periods only, at the end of each work period, components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations, designated by the Engineer within the limits of the highway right of way.

Each vehicle used to place, maintain and remove components of a traffic control system on multilane highways shall be equipped with a Type II flashing arrow sign which shall be in operation when the vehicle is being used for placing, maintaining or removing the components. Vehicles equipped with Type II flashing arrow sign not involved in placing, maintaining or removing the components when operated within a stationary type lane closure shall only display the caution display mode. The sign shall be controllable by the operator of the vehicle while the vehicle is in motion. The flashing arrow sign shown on the plans shall not be used on the vehicles which are doing the placing, maintaining and removing of components of a traffic control system and shall be in place before a lane closure requiring the sign's use is completed.

The traffic cones shown to be placed transversely across closed traffic lanes and shoulders on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be placed.

MOVING LANE CLOSURE

Flashing arrow signs used in moving lane closures shall be truck-mounted. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted and the full operation height of the bottom of the sign may be less than 7 feet above the ground, but should be as high as practicable.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

1. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000, and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:

    1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
    1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501

2. Cal T–001 Model 2 or Model 3, manufacturer and distributor: Hexcel Corporation, 11711 Dublin Boulevard, P.O. Box 2312, Dublin, CA 94568, telephone (925) 551–4900
3. Renco Rengard Model Nos. CAM 8–815 and RAM 8–815, manufacturer and distributor: Renco Inc., 1582 Pflugerville Loop Road, P.O. Box 730, Pflugerville, TX 78660–0730, telephone (800) 654–8182

Each TMA shall be individually identified with the manufacturer's name, address, TMA model number, and a specific serial number. The names and numbers shall each be a minimum 1/2 inch high and located on the left (street) side at the lower front corner. The TMA shall have a message next to the name and model number in 1/2 inch high letters which states, "The bottom of this TMA shall be _____ inches ± _____ inch above the ground at all points for proper impact performance." Any TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge as to whether used TMAs supplied under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMA in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, California 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

PAYMENT

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor, materials (including signs), tools, equipment, and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing and disposing of the components of the traffic control system shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

10-1.17 TEMPORARY PAVEMENT DELINEATION

Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the California MUTCD or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

GENERAL

When the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place before opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided for traveled ways open to public traffic.

The Contractor shall perform the work necessary to establish the alignment of temporary pavement delineation, including required lines or markers. Surfaces to receive application of paint or removable traffic tape temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation, or as determined by the Engineer.

Temporary pavement markers, including underlying adhesive, and removable traffic tape that are applied to the final layer of surfacing or existing pavement to remain in place or that conflicts with a subsequent or new traffic pattern for the area shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

TEMPORARY LANELINE AND CENTERLINE DELINEATION

When lanelines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown on the plans, the minimum laneline and centerline delineation to be provided for that area shall be temporary pavement markers placed at longitudinal intervals of not more than 24 feet. The temporary pavement markers shall be the same color as the laneline or centerline the pavement markers replace. Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (180 days or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. The temporary pavement markers shall be placed in conformance with the manufacturer's instructions. Temporary pavement markers for long term day/night use (180 days or less) shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place the temporary pavement markers in areas where removal of the temporary pavement markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers listed for short term day/night use (14 days or less), shall be placed on longitudinal intervals of not more than 24 feet and shall be used for a maximum of 14 days on lanes opened to public traffic. Before the end of the 14 days the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, the Contractor shall replace the temporary pavement markers and provide additional temporary pavement delineation

and shall bear the cost thereof. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

TEMPORARY EDGELINE DELINEATION

On multilane roadways (freeways and expressways), when edgelines are obliterated and temporary pavement delineation to replace those edgelines is not shown on the plans, the edgeline delineation to be provided for those areas adjacent to lanes open to public traffic shall be as follows:

1. Temporary pavement delineation for right edgelines shall, at the option of the Contractor, consist of either a solid 4-inch wide traffic stripe tape of the same color as the stripe it replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 100 feet.
2. Temporary pavement delineation for left edgelines shall, at the option of the Contractor, consist of either solid 4-inch wide traffic stripe tape of the same color as the stripe it replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 100 feet or temporary pavement markers placed at longitudinal intervals of not more than 6 feet.

The lateral offset for traffic cones, portable delineators or channelizers used for temporary edgeline delineation shall be as determined by the Engineer. If traffic cones or portable delineators are used as temporary pavement delineation for edgelines, the Contractor shall provide personnel to remain at the project site to maintain the cones or delineators during the hours of the day that the portable delineators are in use.

TEMPORARY TRAFFIC STRIPE (PAINT)

The painted temporary traffic stripe shall be complete in place at the location shown before opening the traveled way to public traffic. Removal of painted temporary traffic stripe will not be required.

Temporary painted traffic stripe shall conform to the provisions in "Paint Traffic Stripe and Pavement Marking" of these special provisions, Section 84-3, except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless of whether on new or existing pavement.

TEMPORARY PAVEMENT MARKERS

Temporary pavement markers shall be applied complete in place before opening the traveled way to public traffic.

Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers for long term day/night use (180 days or less) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used in areas where removal of the pavement markers will be required.

Retroreflective pavement markers conforming to the provisions in "Pavement Markers" of these special provisions, "Pavement Markers," of the Standard Specifications may be used in place of temporary pavement markers for long term day/night use (180 days or less) except to simulate patterns of broken traffic stripe. Placement of the retroreflective pavement markers used for temporary pavement markers shall conform to the provisions in "Pavement Markers" of these special provisions except the waiting period provisions before placing the pavement markers on new hot mix asphalt surfacing as specified in Section 85-1.06, "Placement," of the Standard Specifications shall not apply and epoxy adhesive shall not be used to place pavement markers in areas where removal of the pavement markers will be required.

MEASUREMENT AND PAYMENT

Temporary traffic stripe and temporary pavement marking shown on the plans will be measured and paid for in the same manner specified for paint traffic stripe and paint pavement marking in Section 84-3.06, "Measurement," and Section 84-3.07, "Payment," of the Standard Specifications.

Temporary pavement markers shown on the plans will be measured and paid for by the unit in the same manner specified for retroreflective pavement markers in Section 85-1.08, "Measurement," and Section 85-1.09, "Payment," of the Standard Specifications.

Full compensation for furnishing, placing, maintaining, and removing the temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and centerline delineation and signing specified for zones) for those areas where temporary laneline and centerline delineation is not shown on the plans and for providing equivalent patterns of permanent traffic lines for those areas when required, shall be considered as included in the contract prices paid for the items of

work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

Full compensation for furnishing, placing, maintaining, and removing temporary edgeline delineation not shown on the plans shall be considered as included in the contract prices paid for the items of work that obliterated the edgeline pavement delineation and no separate payment will be made therefor. The quantity of channelizers used as temporary edgeline delineation will not be included in the quantity of channelizer (surface mounted) to be paid for.

10-1.18 BARRICADE

Barricades shall be furnished, placed and maintained at the locations shown on the plans, specified in the Standard Specifications or in these special provisions or where designated by the Engineer. Barricades shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Prequalified and Tested Signing and Delineation Materials" of these special provisions regarding retroreflective sheeting for barricades.

Construction area sign and marker panels conforming to the provisions in Section 12-3.06, "Construction Area Signs," of the Standard Specifications shall be installed on barricades in a manner determined by the Engineer at the locations shown on the plans.

Sign panels for construction area signs and marker panels installed on barricades shall conform to the provisions in Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications.

Full compensation for furnishing, installing, maintaining, and removing construction area signs and marker panels on barricades shall be considered as included in the contract unit price paid for the type of barricade involved and no separate payment will be made therefor.

Barricades shown on the plans as part of a traffic control system will be paid for as provided in "Traffic Control System for Lane Closure" of these special provisions and will not be included in the count for payment of barricades.

10-1.19 PORTABLE CHANGEABLE MESSAGE SIGNS

GENERAL

Summary

Work includes furnishing, placing, operating, maintaining, and removing portable changeable message signs.

Comply with Section 12-3.12 "Portable Changeable Message Signs," of the Standard Specifications.

Definitions

useable shoulder area: Paved or unpaved contiguous surface adjacent to the traveled way with:

1. Sufficient weight bearing capacity to support portable changeable message sign
2. Slope not greater than 6:1 (horizontal:vertical)

Submittals

Upon request, submit a Certificate of Compliance for each portable changeable message sign under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

Comply with the manufacturer's operating instructions for portable changeable message sign.

Approaching drivers must be able to read the entire message for all phases at least twice at the posted speed limit before passing portable changeable message sign. You may use more than 1 portable changeable message sign to meet this requirement.

Only display the message shown on the plans or ordered by the Engineer or specified in these special provisions.

MATERIALS

Portable changeable message sign must have 24-hour timer control or remote control capability.

The text of the message displayed on portable changeable message sign must not scroll, or travel horizontally or vertically across the face of the message panel.

CONSTRUCTION

Continuously repeat the entire message in no more than 2 phases of at least 3 seconds per phase.

If useable shoulder area is at least 15 feet wide, the displayed message on portable changeable message sign must be minimum 18-inch character height. If useable shoulder area is less than 15 feet wide, you may use a smaller message panel with minimum 12-inch character height to prevent encroachment in the traveled way.

You or your representative must be available by cell phone for operations that require portable changeable message signs. Give the Engineer your cell phone number. When the Engineer contacts you, immediately comply with the Engineer's request to modify the displayed message.

Start displaying the message on portable changeable message sign 30 minutes before closing the lane.

Place portable changeable message sign in advance of the first warning sign for:

1. Each stationary lane closure
2. Each off-ramp closure
3. Each connector closure
4. Each shoulder closure
5. Each speed reduction zone

Place portable changeable message sign as far from the traveled way as practicable where it is legible to traffic and does not encroach on the traveled way. Place portable changeable sign before or at the crest of vertical roadway curvature where it is visible to approaching traffic. Avoid placing portable changeable message sign within or immediately after horizontal roadway curvature. Where possible, place portable changeable message sign behind guardrail or temporary railing (Type K).

Except where placed behind guardrail or temporary railing (Type K) use traffic control for shoulder closure to delineate portable changeable message sign.

Remove portable changeable message sign when not in use.

10-1.20 CHANNELIZER

Channelizers shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Channelizers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

At the time of completion of the project, certain channelizers shall be left in place as determined by the Engineer. In addition to the contract unit price paid for channelizer (surface mounted), the cost of leaving the channelizers in place will be paid for at the contract unit price for channelizer (surface mounted) (left in place).

When no longer required for the work as determined by the Engineer, channelizers (except channelizers to be left in place) and underlying adhesive used to cement the channelizer bases to the pavement shall be removed. Removed channelizers and adhesive shall become the property of the Contractor and shall be removed from the site of work.

10-1.21 TEMPORARY CRASH CUSHION MODULE

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Temporary crash cushions shall be secured in place prior to commencing work for which the temporary crash cushions are required.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 15 feet or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

Sand filled temporary crash cushion modules shall be one of the following, or equal, and be manufactured after March 31, 1997:

1. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:

    1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
    1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501

2. TrafFix Sand Barrels, manufactured by TrafFix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, telephone (949) 361-5663, FAX (949) 361-9205

    2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287-4303, FAX (408) 287-1929
    2.2. Southern California: Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448, telephone (800) 559-7080, FAX (805) 929-5786

3. CrashGard Model CC-48 Sand Barrels, manufactured by Plastic Safety Systems, Inc., 2444 Baldwin Road, Cleveland, OH 44104:

    3.1. Northern California:

        3.1.1. Capitol Barricade Safety & Sign, 6329 Elvas Ave, Sacramento, CA 95819, telephone (888) 868-5021, FAX (916) 451-5388
        3.1.2. Sierra Safety, Inc., 9093 Old State Highway, New Castle, CA 95658, telephone (916) 663-2026, FAX (916) 663-1858

    3.2. Southern California: Hi Way Safety Inc., 13310 5th Street, Chino, CA 91710, telephone (909) 591-1781, FAX (909) 627-0999

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in pounds for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules may be placed on movable pallets or frames. Comply with dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 12 feet of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with Section 7-1.09, "Public Safety," of the Standard Specifications and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall

be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.22 REMOVE YELLOW TRAFFIC STRIPE (HAZARDOUS WASTE)

GENERAL

Summary

This work includes removing existing yellow thermoplastic traffic stripe at the locations shown on the plans. The residue from the removal of this material is a hazardous waste.

Residue from removal of yellow thermoplastic traffic stripe contains lead chromate. The average lead concentration is greater than or equal to 1000 mg/kg total lead or 5 mg/l soluble lead. When applied to the roadway, the yellow thermoplastic traffic stripe contained as much as 2.6 percent lead. Residue produced from the removal of this yellow thermoplastic traffic stripe contains heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs. For bidding purposes, assume that the residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq. Yellow thermoplastic may produce toxic fumes when heated.

Submittals

Lead Compliance Plan: Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

Work Plan: Submit a work plan for the removal, containment, storage, and disposal of yellow thermoplastic traffic stripe for acceptance not less than 15 days prior to the start of the removal operations. The work plan must include:

1. Objective of the operation
2. Removal equipment
3. Procedures for removal and collection of yellow thermoplastic and yellow painted traffic stripe and pavement marking residue, including dust
4. Type of hazardous waste storage containers
5. Container storage location and how it will be secured
6. Hazardous waste sampling protocol and QA/QC requirements and procedures
7. Qualifications of sampling personnel
8. Analytical lab that will perform the analyses
9. CA Department of Toxic Substances Control (DTSC) registration certificate and California Highway Patrol (CHP) Biennial Inspection of Terminals (BIT) Program compliance documentation of the hazardous waste hauler that will transport the hazardous waste
10. Disposal site that will accept the hazardous waste residue

The Engineer will review the work plan within 5 business days of receipt.

Do not perform work that generates hazardous waste residue until the work plan has been accepted by the Engineer. The Engineer's review and acceptance does not waive any contract requirements and does not relieve the Contractor from complying with Federal, State, and local laws, regulations, and requirements.

Correct any rejected work plan and resubmit a corrected work plan within 5 business days of notification by the Engineer; at which time a new review period of 5 business days will begin.

Analytical Test Results: Submit analytical test results of the residue from removal of yellow thermoplastic traffic stripe, including chain of custody documentation, for review and acceptance before:

1. Requesting the Engineer's signature on the waste profile requested by the disposal facility
2. Requesting the Engineer obtain an EPA ID no. for disposal
3. Removing the residue from the site

United States Environmental Protection Agency Identification Number Request: Submit a request for the U.S. EPA ID no. when the Engineer accepts analytical test results documenting that residue from removal of yellow thermoplastic traffic stripe is a hazardous waste.

Disposal Documentation: Submit receiving landfill documentation of proper disposal within 5 business days of residue transport from the project.

CONSTRUCTION

Where grinding or other approved methods are used to remove yellow thermoplastic traffic stripe that will produce a hazardous waste residue, the removed residue, including dust, must be contained and collected immediately. Use a HEPA filter-equipped vacuum attachment operated concurrently with the removal operations or other equally effective approved methods for collection of the residue.

Store hazardous waste residue in labeled and covered containers. Labels must comply with the provisions of 22 CA Code of Regs §§66262.31 and 66262.32. Mark labels with:

1. Date the hazardous waste is generated
2. The words "Hazardous Waste"
3. Composition and physical state of the hazardous waste (for example, asphalt grindings with thermoplastic or paint)
4. The word "Toxic"
5. Name, address, and telephone no. of the Engineer
6. Contract no.
7. Contractor or subcontractor name

Use metal containers approved by the U.S. Department of Transportation for the transportation and temporary storage of the removed residue. Handle the containers such that no spillage occurs. Store containers in a secured enclosure. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the project limits until disposal as approved.

Make necessary arrangements to test the yellow thermoplastic hazardous waste residue as required by the disposal facility and these special provisions. Testing must include, at a minimum:

1. Total lead by EPA Method 6010B
2. Total chromium by US EPA Method 6010B series
3. Soluble lead by California Waste Extraction Test
4. Soluble chromium by California Waste Extraction Test
5. Soluble lead by Toxicity Characteristic Leaching Procedure
6. Soluble chromium by Toxicity Characteristic Leaching Procedure

From the 1st 220 gallons of hazardous waste or portion thereof if less than 220 gallons of hazardous waste are produced, a minimum of 4 randomly selected samples must be taken and analyzed individually. Samples must not be composited. From each additional 880 gallons of hazardous waste or portion thereof if less than 880 gallons are produced, a minimum of 1 additional random sample must be taken and analyzed. Use chain of custody procedures consistent with Chapter 9 of U.S. EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) while transporting samples from the project to the laboratory. Each sample must be homogenized before analysis by the laboratory performing the analyses. A sample aliquot sufficient to cover the amount necessary for the total and the soluble analyses must then be taken. This aliquot must be homogenized a 2nd time and the total and soluble analyses run on this aliquot. The homogenization process must not include grinding of the samples. Submit the name and location of the disposal facility that will be accepting the hazardous waste and the analytical laboratory along with the testing requirements not less than 5 business days before the start of removal of yellow thermoplastic traffic stripe. The analytical laboratory must be certified by the CA Department of Public Health Environmental Laboratory Accreditation Program for all analyses to be performed.

After the Engineer accepts the analytical test results, dispose of yellow thermoplastic and yellow paint hazardous waste residue at a California Department of Toxic Substance Control permitted Class 1 disposal facility located in CA under the requirements of the disposal facility operator within 30 days after accumulating 220 pounds of residue and dust.

If less than 220 pounds of hazardous waste residue and dust is generated in total, it must be disposed of within 30 days after the start of accumulation of the residue and dust.

Use a hazardous waste manifest and a transporter registered with the CA Department of Toxic Substance Control and in compliance with the CHP BIT Program. The Engineer will obtain the U.S. EPA ID no. and will sign all manifests as the generator within 2 business days of receiving and accepting the analytical test results and receiving your request for the U.S. EPA ID no.

If analytical test results demonstrate that the residue is a non–hazardous waste and the Engineer agrees, dispose of the residue at an appropriately permitted Class II or Class III facility under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

The contract price paid per linear foot for remove yellow thermoplastic traffic stripe (hazardous waste) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all of the work involved in removal, containment, storage, and disposal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for (1) work plan for the removal, containment, storage, and disposal of yellow thermoplastic traffic stripe hazardous waste residue, (2) analytical test results, (3) US EPA ID no. request, and (4) receiving landfill documentation of proper disposal are included in the contract prices paid per linear foot for remove yellow thermoplastic traffic stripe (hazardous waste) and no separate payment will be made therefor.

If analytical test results demonstrate that the residue is a non–hazardous waste and the Engineer agrees to disposal at a non–hazardous waste disposal facility, no cost adjustment will be made.

10-1.23 EXISTING HIGHWAY FACILITIES

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

REMOVE SIGN STRUCTURE

Existing sign structures, where shown on the plans to be removed, shall be removed and disposed of.

Overhead sign structure removal shall consist of removing posts, frames, portions of foundations, sign panels, walkways with safety railings, and sign lighting electrical equipment.

A sign structure shall not be removed until the structure is no longer required for the direction of public traffic.

Concrete foundations may be abandoned in place, except that the top portion, including anchor bolts, reinforcing steel, and conduits shall be removed to a depth of not less than 3 feet below the adjacent finished grade. The resulting holes shall be backfilled and compacted with material equivalent to the surrounding material.

Electrical wiring shall be removed to the nearest pull box. Fuses within spliced connections in the pull box shall be removed and disposed of.

Electrical equipment, where shown on the plans, shall be salvaged.

REMOVE PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

This work includes removing existing traffic stripe and pavement marking at the locations shown on the plans.

Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

Waste residue from removal of thermoplastic and painted traffic stripe and pavement marking is a non–hazardous waste residue and contains lead in average concentrations less than 1000 mg/kg total lead and 5 mg/L soluble lead. This waste residue does not contain heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs and is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

RESIDUE CONTAINING LEAD FROM PAINT AND THERMOPLASTIC

Residue from grinding or cold planing contains lead from paint and thermoplastic. The average lead concentrations are less than 1,000 mg/kg total lead and 5 mg/L soluble lead. This residue:

1. Is a nonhazardous waste
2. Does not contain heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs
3. Is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

Payment for handling, removal, and disposal of grinding or cold planing residue that is a nonhazardous waste is included in the payment for the type of removal work involved.

REMOVE ROADSIDE SIGN

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

RESET ROADSIDE SIGN

Existing roadside signs, where shown on the plans to be reset, shall be removed and reset.

Each roadside sign shall be reset on the same day that the sign is removed.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

COLD PLANE ASPHALT CONCRETE PAVEMENT

GENERAL

Summary

This work includes cold planing existing asphalt concrete pavement.

Sequencing and Scheduling

Schedule cold planing activities to ensure hot mix asphalt (HMA) is placed over cold planed area during the same work shift before opening to traffic. If you cannot place HMA over the entire cold planed area before opening it to traffic:

1. Construct a temporary HMA taper to the level of the existing pavement.
2. Place HMA during the next lane or shoulder closure for that area.
3. Submit a corrective action plan that shows that you are able to cold plane and place HMA in the same work shift. Do not perform cold planing work until the Engineer approves the corrective action plan.

MATERIALS

HMA for temporary tapers must be of the same quality as the HMA used elsewhere on the project or comply with "Minor Hot Mix Asphalt" of these special provisions.

CONSTRUCTION

General

Perform planing of asphalt concrete pavement without the use of a heating device to soften the pavement.

Cold Planing Equipment

Cold planing machine must be:

1. Equipped with a cutter head width that matches the planing width. If the only available cutter head width is wider than the cold plane area shown, submit to the Engineer a request for using a wider cutter head. Do not cold plane until the Engineer approves your request.

2. Equipped with automatic controls to control the longitudinal grade and transverse slope of the cutter head and:

    2.1. If a ski device is used, it must be at least 30 feet long, rigid, and 1 piece unit. The entire length must be used in activating the sensor.
    2.2. If referencing from existing pavement, the cold planing machine must be controlled by a self-contained grade reference system. The system must be used at or near the centerline of the roadway. On the adjacent pass with the cold planing machine, a joint matching shoe may be used.

3. Equipped to effectively control dust generated by the planing operation.
4. Operated so that no fumes or smoke is produced.

Replace broken, missing, or worn machine teeth.

Grade Control and Surface Smoothness

Furnish, install, and maintain grade and transverse slope references.

The depth, length, width, and shape of the cut must be as shown or as ordered. The final cut must result in a neat and uniform surface. Do not damage remaining surface.

The completed surface of the planed asphalt concrete pavement must not vary more than 0.02 foot when measured with a 12-foot straightedge parallel with the centerline. The transverse slope of the planed surface must not vary more than 0.03 foot from the straightedge when placed at right angles to the centerline.

A drop-off of more than 0.15 foot is not allowed between adjacent lanes open to public traffic.

Temporary HMA Tapers

If a drop-off between the existing pavement and the planed area at transverse joints cannot be avoided before opening to traffic, construct a temporary HMA taper. HMA for temporary taper must be:

1. Placed to the level of the existing pavement and tapered on a slope of 30:1 (Horizontal: Vertical) or flatter to the level of the planed area
2. Compacted by any method that will produce a smooth riding surface
3. Completely removed before placing the permanent surfacing. The removed material must be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Disposal of Planed Material

Remove cold planed material concurrent with planing activities, within 50 feet of the planer or as ordered.

Dispose of planed material and under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Cold plane asphalt concrete pavement is measured by the square yard.

The contract price paid per square yard for cold plane asphalt concrete pavement includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including constructing, maintaining, removing temporary HMA tapers if applicable, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

Full compensation for removal of thermoplastic traffic stripe, painted traffic stripe, and pavement marking in areas of cold plane asphalt concrete is included in the contract price paid for cold plane asphalt concrete and no separate payment will be made therefor.

10-1.24 CLEARING AND GRUBBING

Comply with Section 16, "Clearing and Grubbing," of the Standard Specifications and with "Duff" of these special provisions regarding duff collection.

Clear areas to receive gravel mulch of trash and debris. Remove vegetation to the ground. Disposed cleared trash, debris and removed vegetation outside the highway right of way in conformance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

10-1.25 WATERING

Developing a water supply and applying watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications and these special provisions.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding availability of water.

10-1.26 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Where gravel mulch and rock blanket is to be placed, the grading plane shall not extend above the grade established by the Engineer.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 0.17-foot before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic yard for roadway excavation and no additional compensation will be allowed therefor.

The portion of imported borrow placed within 4 feet of the finished grade shall have a Resistance (R-Value) of not less than 40.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 2 feet below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 3/4 inch from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic yard for the types of excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

At the locations and to the limits shown on the plans, material below the bottom of bridge footings shall be removed and replaced with Class 3 concrete. Removal of the material will be measured and paid for by the cubic yard as structure excavation (bridge) and furnishing, placing, and compacting the replacement material will be measured and paid for by the cubic yard as structure backfill (bridge).

At the footings where material is removed and replaced, as described herein, a relative compaction of not less than 95 percent shall be obtained for a minimum depth of 0.5 foot below the bottom of excavation if the bottom of subexcavation is disturbed.

If structure excavation or structure backfill for bridges is not otherwise designated by type and payment for the structure excavation or structure backfill has not otherwise been provided for in the Standard Specifications or these special provisions, the structure excavation or structure backfill will be measured and paid for as structure excavation (bridge) or structure backfill (bridge), respectively.

10-1.27 DUFF

GENERAL

Summary

This work includes collecting, processing, stockpiling, and placing duff.
Section 16-1.04, "Removal and Disposal of Material," of the Standard Specifications does not apply.

MATERIAL

Duff consists of vegetation including trees, shrubs, ground cover, grasses, bark, leaves, and roots including attached soil.

CONSTRUCTION

Collect duff from clearing and grubbing areas excluding the non paved channel location, building locations, areas to be paved and areas where gravel much is to be applied.

Process duff to a maximum dimension of 6 inches.

Stockpile duff material until work in the area to receive the duff is complete. Duff stockpiles shall not exceed 6 feet in height.

Upon completion of the earthwork in an area, spread duff to a uniform thickness throughout all areas disturbed by the Contractor's operations excluding the non paved channel location, building locations, paved areas and areas where gravel mulch is to be applied. Roadway and adjacent areas should be left in a neat and finished appearance

Incorporate duff into the top 6 inches of earthwork.

PAYMENT

Duff will be measured by the square yard applied in place. No payment will be made for duff placed outside the limits shown on the plans.

The contract price paid per square yard for duff shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in duff, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.28 ROCK BLANKET

Rock blanket shall be placed as shown on the plans and in conformance with these special provisions.

MATERIALS

Rock for the rock blanket shall be clean, smooth multi-colored cobble type rock naturally colored reddish brown in overall appearance after placement and shall be obtained from a single source.

Rock shall conform to the following sizing:

Rock Size (Inches)	Percentage
6-12	100

A sample of the rock shall be submitted to the Engineer for approval prior to delivery of the rock to the project site.

Rock shall be secured in place with Class 2 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions. Concrete aggregate size shall be 3/8 inch maximum.

SITE PREPARATION

Areas to receive rock blanket shall be cleared of trash and debris. Weeds shall be removed to the ground level. Cleared trash, debris and removed weeds shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

After clearing, the areas shall be excavated to the depth shown on the plans, graded to a smooth uniform surface and compacted to a minimum relative compaction of 80 percent.

After compaction, the areas shall be sterilized with oxadiazon. The sterilant shall be applied at the maximum label rate and shall not be applied more than 12 inches beyond the rock blanket limits. Soil sterilant shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications.

PLACEMENT

Rock shall be placed randomly mixing the various sizes of rock while concrete is still plastic, and spaced as shown on the plans. Rocks shall have a 1 inch maximum separation between the top of adjacent rock surfaces. The Contractor shall remove concrete adhering to the exposed surfaces of the rock. Loose rocks, shall be reset at the Contractor's expense by methods determined by the Engineer.

Gaps between the rocks shall be filled with dry applied mortar. Mortar shall be one part Portland cement and two parts sand by volume. Finished Rock Blanket surfacing shall be uniform and maintain flow lines, slope gradients and contours of the project site.

Test Panel. A test panel at least 6'-0" x 6'-0" in size shall be successfully completed at a location approved by the Engineer before beginning work on placing Rock Blanket. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used for finished Rock Blanket. If ordered by the Engineer, additional test panels shall be constructed until the specified placement, finish, and texture is obtained, as determined by the Engineer.

In the event more than two tests panels are required by the Engineer, each additional sample will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of placing Rock Blanket.

MEASUREMENT AND PAYMENT

Rock blanket will be measured by the square yard as determined from actual measurements made parallel to the ground slope.

The contract price paid per square yard for rock blanket shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing rock blanket, complete in place, including furnishing and applying soil sterilant, wood headers and metal stakes as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.29 IRRIGATION CROSSOVERS

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits shall be bituminous coated corrugated steel pipe.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Fittings for water line crossovers shall be Schedule 80.

Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

10-1.30 IRRIGATION SLEEVE

Irrigation sleeves shall be 12" bituminous-coated corrugated steel pipe conduit (.064" Thick) pipe and shall conform to the provisions in Section 20-2.16, "Conduit," of the Standard Specifications and these special provisions.

Irrigation sleeves shall be installed as shown on the plans.

Quantities of irrigation sleeve to be paid will be determined from the slope length designated by the Engineer. Irrigation sleeve placed in excess of the lengths designated will not be paid for.

The contract price paid per linear foot for irrigation sleeve shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in irrigation sleeve, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.31 ROCK OUTCROPPINGS

Rock outcroppings shall be placed and sized as shown on the plans in accordance with these special provisions.

Rock to be used for rock outcroppings shall be angular in form, naturally colored burgundy for one type of rock and gold for the other and shall be the same type of material as specified under "Gravel Mulch" elsewhere in these special provisions.

All rock tentatively selected for use as rock outcroppings shall be approved by the Engineer prior to placement. Proposed gold colored rock shall be selected to minimize the amount of green colored tint. The rock shall be cleaned prior to inspection by the Engineer.

The areas to receive rock outcroppings shall be excavated and compacted. The excavated material may be disposed of by spreading the material evenly over adjacent non-paved areas within the project limits at locations designated by the Engineer.

The exposed surface of the rock outcroppings shall be free of debris. Any debris adhering to the exposed surfaces of the rock shall be removed.

Rock outcroppings will be measured by the unit as determined from the actual count in place. Each individual rock will be considered a single unit, as determined from the actual count in place.

The contract unit prices paid for the various sizes and colors of rock outcroppings shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in rock outcroppings, complete in place, including transporting, excavating and compacting the areas to receive the rock outcroppings, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-1.32 PRECAST CONCRETE TRASH RECEPTACLE

Precast concrete trash receptacles shall be furnished and installed per the manufacturer's recommendations and in conformance with details shown on the plans and these special provisions and as directed by the Engineer. Precast concrete trash receptacles shall be manufactured of aggregates, sand and cement conforming to ASTM designation C-150. Steel reinforcing shall consist of No.2 and No.3 bar with welded wire mesh reinforcing producing a tensile strength of 80,900 psi.

Precast concrete trash receptacle shall have a matte sealer coating.

The contract unit price paid for precast concrete trash receptacle shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in precast concrete trash receptacles, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.33 TREE WELL GRATE

Tree well grates including grate frames shall be furnished and installed in conformance with these special provisions and as directed by the Engineer.

Tree well grates shall be manufactured of non-finished (non painted color), grey iron castings with 1/4" inch slot openings and shall conform to ASTM designation A-48 Class 35. Tree well grates shall be installed as shown on the plans and as recommended by the manufacturer.

The contract unit price paid for tree well grate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing tree well grates, including grate frames complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.34 GRAVEL MULCH

This work includes furnishing and placing gravel mulch, including site preparation, earthwork, edging, and soil treatment in conformance with the Standard Specifications, these special provisions and as directed by the Engineer.

MATERIALS

Edging must be commercial quality, made of steel, and shall have a brown colored powder coated finish. Edging must be a minimum 5 inches in height x 0.2" thick Edging must be anchored with steel stakes. Stake size and spacing must be per edging manufacturer's specifications for use and site conditions. Furnish the Engineer a copy of the manufacturers product sheets together with instructions for installation 5 days before application.

Soil Treatment

Dichlobenil must conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specification, except recommendations from a Pest Control Adviser will not be required.

Gravel

Gravel must consist of crushed rock and must conform to the following requirements: The various gravel sizes shall be as shown on the plans.

The natural color and types of gravel shall be gold/tan colored quartzite rock and burgundy colored rock. Cinder or lava type rock shall not be used

Gravel must closely resemble the texture and color of the referee samples available for inspection at the Department of Transportation – District 8 Landscape Architecture Office, Ph (909) 383-4521 located at 464 West Fourth Street, 10th floor, San Bernardino, Ca 92401-1400.

The Contractor must submit a 5 pound sample of each type and size of gravel to the Engineer for approval before delivery of materials to the site.

Clearing

Prior to gravel mulch installation, the areas must be cleared as specified under "Clearing and Grubbing" in these special provisions.

Earthwork

Earthwork must conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

After clearing, excavate the areas to receive gravel mulch, grade to a smooth surface, and compact to not less than 80 percent relative compaction.

Soil Treatment

Following excavation and compaction, scarify the subbase for gravel mulch to a minimum depth of 3 inches. Remove and dispose rocks, large clods of earth, roots, weeds, and other debris greater than one inch in diameter.

Bring the loosened material to as finely a divided condition as the material will permit. The soil surface must be firm and stable.

After scarification, sterilize the soil with Dichlobenil applied at the maximum label rate. Dicholbenil must conform to Section 20-4.026, "Pesticides," of the Standard Specifications and the manufacturer's recommendations.

Mix pesticides in conformance with the manufacturer's recommendations and apply by a device approved by the Engineer. Pesticides must not be applied more than 8 hours prior to placing gravel mulch. Do not apply pesticides more than 12 inches beyond the areas to be surfaced.

PLACEMENT

Install edging to delineate the limits of the gravel mulch as specified in these special provisions. Edging will not be required between gravel mulch areas and the adjacent face of soundwalls, pavement edges, or rock blanket areas.

When placement is complete the surface must be uniform, maintain original flow lines, slope gradient and contours of the project site.

MEASUREMENT

Gravel mulch will be measured by the cubic yard, as determined from actual measurements made parallel to the ground slope.

PAYMENT

The contract unit price paid per cubic yard for the various sizes and colors of gravel mulch includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in providing and placing gravel mulch, complete in place, including site preparation, earthwork, soil treatment and edging, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.35 AGGREGATE SUBBASE

Aggregate subbase must comply with Section 25, "Aggregate Subbases," of the Standard Specifications and these special provisions.

Aggregate subbase must be Class 2.

Do not store reclaimed asphalt concrete or aggregate subbase with reclaimed asphalt concrete within 100 feet measured horizontally of any culvert, watercourse, or bridge.

10-1.36 AGGREGATE BASE

Aggregate base must comply with Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

Aggregate base must be Class 2.

Do not store reclaimed asphalt concrete or aggregate base with reclaimed asphalt concrete within 100 feet measured horizontally of any culvert, watercourse, or bridge.

10-1.37 LEAN CONCRETE BASE

Lean concrete base shall conform to the provisions in Section 28, "Lean Concrete Base," of the Standard Specifications and these special provisions.

The finished surface of lean concrete base shall not be above the grade established by the Engineer, or more than 0.05-foot below the grade established by the Engineer.

10-1.38 HOT MIX ASPHALT

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type A using the Standard process.

Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

1. A summary of data cores taken
2. A photograph of each data core

For each data core, the summary must include:

1. Project identification number
2. Date cored
3. Core identification number
4. Type of materials recovered
5. Type and approximate thickness of unstabilized material not recovered
6. Total core thickness
7. Thickness of each individual material to within:

    7.1. For recovered material, 1/2 inch
    7.2. For unstabilized material, 1.0 inch

8. Location including:

    8.1. County
    8.2. Route
    8.3. Post mile
    8.4. Lane number
    8.5. Lane direction
    8.6. Station

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. The core
2. Project identification number
3. Core identification number
4. Date cored
5. County
6. Route
7. Post mile
8. Lane number
9. Lane direction

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type A must be PG 64-28 PM.

Aggregate

The aggregate for HMA Type A must comply with the 3/4 inch grading.

CONSTRUCTION

Rumble Strips

Construct rumble strips in the top layer of new HMA surfacing.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 4-inch or 6-inch diameter data cores:

1. At the beginning, end, and every 1/2 mile within the paving limits of each route on the project
2. After all paving is complete
3. From the center of the specified lane

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material
2. Crumbled or cracked stabilized material
3. Sandy or clayey soil

PAYMENT

The contract lump sum price paid for data core includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in data coring, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.39 RUMBLE STRIP

GENERAL

Summary

This work includes constructing rumble strips in the top layer of hot mix asphalt surfacing by ground-in methods.

CONSTRUCTION

Select the method and equipment for constructing ground-in indentations.

Do not construct rumble strips on structures or approach slabs.

Construct rumble strips within 2 inches of the specified alignment. The grinding equipment must be equipped with a sighting device enabling the operator to maintain the rumble strip alignment.

Indentations must comply with the specified dimensions within 0.06 inch in depth and 10 percent in length and width.

The Engineer orders grinding or removal and replacement of noncompliant rumble strips to bring them within specified tolerances. Ground surface areas must be neat and uniform in appearance.

The grinding equipment must be equipped with a vacuum attachment to remove residue from the roadbed.

Dispose of removed material under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

On ground areas, apply fog seal coat under Section 37-1, "Seal Coats," of the Standard Specifications.

MEASUREMENT AND PAYMENT

The contract price paid per station for rumble strip includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing rumble strip complete in place including furnishing and applying fog seal coat to the actual ground areas, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.40 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - SLURRY METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the slurry method and placing it in stockpiles to marinate.

Treat aggregate for HMA Type C with lime slurry.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submit the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit a treatment data log from the slurry proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. Wet aggregate flow rate collected directly from the aggregate weigh belt
5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate weight
6. Dry aggregate flow rate calculated from the wet aggregate flow rate
7. Lime slurry flow rate measured by the slurry meter
8. Dry lime flow rate calculated from the slurry meter output
9. Approved lime ratio for each aggregate size being treated
10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate weight
11. Calculated difference between the approved lime ratio and the actual lime ratio
12. Dry lime and water proportions at the slurry treatment time

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

Your quality control plan (QCP) must include aggregate quality control sampling and testing during aggregate lime treatment. Perform sampling and testing in compliance with:

Aggregate Quality Control During Lime Treatment

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 1,000 tons of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	CT 234	
Flat and elongated particles	CT 235	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log.
2. Do not submit the aggregate quality control data.
3. Submit incomplete, untimely, or incorrectly formatted data.
4. Do not take corrective actions.
5. Take late or unsuccessful corrective actions.
6. Do not stop treatment when proportioning tolerances are exceeded.
7. Use malfunctioning or failed proportioning devices.

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

For the aggregate to be treated, determine the moisture content at least once during each 2 hours of treatment. Calculate moisture content under California Test 226 or California Test 370 and report it as a percent of dry aggregate weight. Use the moisture content calculations as a set point for the proportioning process controller.

MATERIALS

High-calcium hydrated lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate. If reclaimed asphalt pavement (RAP) is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Treat aggregate separate from HMA production.

Do not treat RAP.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to between 2 parts and 3 parts water by weight. The slurry must completely coat the aggregate.

Lime treat and marinate coarse and fine aggregates separately.

Immediately before mixing lime slurry with aggregate, water must not visibly separate from aggregate.

Treat aggregate and stockpile for marination only once.

The lime ratio is the pounds of dry hydrated lime per 100 pounds of dry virgin aggregate expressed as a percent. Water content of slurry or untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined virgin aggregate	0.8 to 1.5

The lime ratio for fine and coarse aggregate must be within ±0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ±0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions. The lime ratio must be determined before the addition of RAP.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's total treatment in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

Lime Slurry Proportioning

Proportion lime and water with a continuous or batch operation.

The device controlling slurry proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by the data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the contract's duration, collected data must be stored by the controller.

Proportioning and Mixing Lime Slurry Treated Aggregate

Treat HMA aggregate by proportioning lime slurry and aggregate by weight in a continuous operation.

Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

MEASUREMENT AND PAYMENT

Full compensation for treating aggregates with lime slurry shall be considered as included in the contract price paid per ton for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.41 HOT MIX ASPHALT AGGREGATE LIME TREATMENT - DRY LIME METHOD

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the dry lime method either with marination or without.

Treat aggregate for HMA Type C with dry lime.

Marinate aggregate if the plasticity index determined under California Test 204 is from 4 to 10.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

If marination is required, submit in writing the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit in writing a treatment data log from the dry lime and aggregate proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. HMA type and mix aggregate size
5. Wet aggregate flow rate collected directly from the aggregate weigh belt
6. Aggregate moisture content, expressed as a percent of the dry aggregate weight
7. Flow rate of dry aggregate calculated from the flow rate of wet aggregate
8. Dry lime flow rate
9. Lime ratio from the accepted JMF for each aggregate size being treated
10. Lime ratio from the accepted JMF for the combined aggregate
11. Actual lime ratio calculated from the aggregate weigh belt output, the aggregate moisture input, and the dry lime meter output, expressed as a percent of the dry aggregate weight
12. Calculated difference between the approved lime ratio and the actual lime ratio

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

If marination is required, the quality control plan (QCP) specified in Section 39-4, "Quality Control / Quality Assurance," must include aggregate quality control sampling and testing during lime treatment. Perform sampling and testing in compliance with:

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 1,000 tons of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	CT 234	
Flat and elongated particles	CT 235	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log
2. Do not submit the aggregate quality control data for marinated aggregate
3. Submit incomplete, untimely, or incorrectly formatted data
4. Do not take corrective actions
5. Take late or unsuccessful corrective actions
6. Do not stop treatment when proportioning tolerances are exceeded
7. Use malfunctioning or failed proportioning devices

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

MATERIALS

Lime must be high-calcium hydrated lime. Lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate. If reclaimed asphalt pavement (RAP) is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer in writing at least 24 hours before the start of aggregate treatment.

Do not treat RAP.

If marination is required:

1. Treat and marinate coarse and fine aggregates separately.
2. Treat aggregate and stockpile for marination only once.
3. Treat aggregate separate from HMA production.

The lime ratio is the pounds of dry hydrated lime per 100 pounds of dry virgin aggregate expressed as a percent. Water content of untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined virgin aggregate	0.8 to 1.5

The lime ratio for fine and coarse aggregate must be within ±0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ±0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions. Determine the lime ratio before you add RAP.

Proportion dry lime by weight with a continuous operation.

The device controlling dry lime and aggregate proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by a data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the controller.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's treated aggregate in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

If you use a batch-type proportioning operation for HMA production, control proportioning in compliance with the specifications for continuous mixing plants. Use a separate dry lime aggregate treatment operation from HMA batching operations including:

1. Pugmill mixer
2. Controller
3. Weigh belt for the lime
4. Weigh belt for the aggregate

If using a continuous mixing operation for HMA without lime marinated aggregates, use a controller that measures the blended aggregate weight after any additional water is added to the mixture. The controller must determine the amount of lime added to the aggregate from the aggregate weigh belt input in connection with the manually input total aggregate moisture, the manually input target lime content, and the lime proportioning system output. Use a continuous aggregate weigh belt and pugmill mixer for the lime treatment operation in addition to the weigh belt for the aggregate proportioning to asphalt binder in the HMA plant. If you use a water meter for moisture control for lime treatment, the meter must comply with California Test 109.

At the time of mixing dry lime with aggregate, the aggregate moisture content must ensure complete lime coating. The aggregate moisture content must not cause aggregate to be lost between the point of weighing the combined aggregate continuous stream and the dryer. Add water for mixing and coating aggregate to the aggregate before dry lime addition. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate.

The HMA plant must be equipped with a bag house dust system. Material collected in the dust system must be returned to the mix.

Mixing Dry Lime and Aggregate

Mix aggregate, water, and dry lime with a continuous pugmill mixer with twin shafts. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate. Store dry lime in a uniform and free flowing condition. Introduce dry lime to the pugmill in a continuous operation. The introduction must occur after the aggregate cold feed and before the point of proportioning across a weigh belt and the aggregate dryer. Prevent loss of dry lime.

If marination is required, marinate treated aggregate in stockpiles between 24 hours and 60 days before using in HMA. Do not use aggregate marinated more than 60 days.

The pugmill must be equipped with paddles arranged to provide sufficient mixing action and mixture movement. The pugmill must produce a homogeneous mixture of uniformly coated aggregates at mixer discharge.

If the aggregate treatment operation is stopped longer than 1 hour, clean the equipment of partially treated aggregate and lime.

Aggregate must be completely treated before introduction into the mixing drum.

MEASUREMENT AND PAYMENT

Full compensation for dry lime treating HMA aggregate including marination shall be considered as included in the contract price paid per ton for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.42 LIQUID ANTISTRIP TREATMENT

GENERAL

Summary

This work includes treating asphalt binder with liquid antistrip (LAS) treatment to bond the asphalt binder to aggregate in hot mix asphalt (HMA).

Submittals

For LAS, submit with the proposed job mix formula (JMF) submittal under Section 39, "Hot Mix Asphalt," of the Standard Specifications:

1. Materials Safety Data Sheet (MSDS)
2. One 1-pint sample
3. Infrared analysis including copy of absorption spectra

Submit a certified copy of test results and a MSDS for each LAS lot.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each LAS shipment. With each certificate also submit:

1. Your signature and printed name
2. Shipment number
3. Material type
4. Material specific gravity
5. Refinery
6. Consignee
7. Destination
8. Quantity
9. Contact or purchase order number
10. Shipment Date

Submit proportions for LAS as part of the JMF submittal specified in Section 39-1.03, "Hot Mix Asphalt Mix Design Requirements," of the Standard Specifications. If you change the brand or type of LAS, submit a new JMF.

For each job site delivery of LAS, submit one 1/2-pint sample to the Transportation Laboratory. Submit shipping documents to the Engineer. Label each LAS sampling container with:

1. LAS type
2. Application rate
3. Sample date
4. Contract number

At the end of each day's production shift, submit production data in electronic and printed media. Present data on electronic media in tab delimited format. Use line feed carriage return with one separate record per line for each production data set. Allow sufficient fields for the specified data. Include data titles at least once per report. For each mixing operation type, submit in order:

1. Batch Mixing:

    1.1. Production date
    1.2. Time of batch completion
    1.3. Mix size and type
    1.4. Each ingredient's weight
    1.5. Asphalt binder content as percentage of dry aggregate weight
    1.6. LAS content as percentage of asphalt binder weight

2. Continuous Mixing:

    2.1. Production date
    2.2. Data capture time
    2.3. Mix size and type
    2.4. Flow rate of wet aggregate collected directly from the aggregate weigh belt
    2.5. Aggregate moisture content as percentage of dry aggregate weight
    2.6. Flow rate of asphalt binder collected from the asphalt binder meter
    2.7. Flow rate of LAS collected from the LAS meter
    2.8. Asphalt binder content as percentage of dry aggregate weight calculated from:

        2.8.1. Aggregate weigh belt output
        2.8.2. Aggregate moisture input
        2.8.3. Asphalt binder meter output

    2.9. LAS content as percentage of asphalt binder weight calculated from:

        2.9.1. Asphalt binder meter output
        2.9.2. LAS meter output

Quality Control and Assurance

For continuous mixing and batch mixing operations, sample asphalt binder before adding LAS. For continuous mixing operations, sample combined asphalt binder and LAS after the static mixer.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit data
2. Submit incomplete, untimely, or incorrectly formatted data
3. Do not take corrective actions
4. Take late or unsuccessful corrective actions
5. Do not stop production when proportioning tolerances are exceeded
6. Use malfunctioning or failed proportioning devices

If you stop production, notify the Engineer of any corrective actions taken before resuming.

MATERIALS

LAS-treated asphalt binder must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications. LAS does not substitute for asphalt binder.

LAS total amine value must be 325 minimum when tested under ASTM D 2074.

Use only 1 LAS type or brand at a time. Do not mix LAS types or brands.

Store and mix LAS under the manufacturer's recommendations.

CONSTRUCTION

LAS must be between 0.5 and 1.0 percent by weight of asphalt binder.

If 3 consecutive sets of recorded production data show actual delivered LAS weight is more than ±1 percent of the approved mix design LAS weight, stop production and take corrective action.

If a set of recorded production data shows actual delivered LAS weight is more than ±2 percent of the approved mix design LAS weight, stop production. If the LAS weight exceeds 1.2 percent of the asphalt binder weight, do not use the HMA represented by that data.

The continuous mixing plant controller proportioning the HMA must produce a production data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily production. The data must be a production activity register and not a summation. The material represented by the data is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the plant controller or a computer's memory at the plant.

MEASUREMENT AND PAYMENT

Full compensation for LAS is included in the contract price paid per ton for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.43 HOT MIX ASPHALT (TYPE C)

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type C using the Quality Control / Quality Assurance process.

Comply with the specifications for HMA Type A under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submittals

Quality Control / Quality Assurance Projects

With the job mix formula (JMF) submittal, submit:

1. California Test 204 plasticity index results
2. California Test 371 tensile strength ratio results for untreated HMA
3. California Test 371 tensile strength ratio results for treated HMA if untreated HMA tensile strength ratio is below 70

At project start-up and once during production, submit samples split from your HMA production sample for California Test 371 to the Engineer and the Transportation Laboratory, Attention: Moisture Test.

With the JMF submittal, at project start-up, and every 5,000 tons, submit the California Test 371 test results for mix design and production to the Engineer and electronically to:

Moisture_Tests@dot.ca.gov

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

1. A summary of data cores taken
2. A photograph of each data core

For each data core, the summary must include:

1. Project identification number
2. Date cored
3. Core identification number
4. Type of materials recovered
5. Type and approximate thickness of unstabilized material not recovered
6. Total core thickness
7. Thickness of each individual material to within:

    7.1 For recovered material, 1/2 inch
    7.2 For unstabilized material, 1.0 inch

8. Location including:

    8.1. County
    8.2. Route
    8.3. Post mile
    8.4. Lane number
    8.5. Lane direction
    8.6. Station

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. The core
2. Project identification number
3. Core identification number
4. Date cored
5. County
6. Route
7. Post mile
8. Lane number
9. Lane direction

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Quality Control and Assurance

Quality Control / Quality Assurance Projects

For the mix design, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment Lab Procedures for Mix Design

Antistrip Treatment	Lab Procedure
Plasticity index from 4 to 10 [a]	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

Notes:
[a] If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on plasticity index.
2. Test treated HMA under California Test 371.
3. Treat to a minimum tensile strength ratio of 70.

On the first production day and at least every 5,000 tons, sample HMA and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance.

With the minimum quality control testing for the specified construction process, perform sampling and testing at the specified frequency for the following quality characteristics:

Minimum Quality Control

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	Requirement	
Asphalt binder content (%)	CT 379 or 382	1 per 750 tons and any remaining part	JMF ± 0.40	
Stabilometer Value [a, b] (min.)	CT 366	1 per 4,000 tons or 1 per 2 business days, whichever is more	37 [c] (Modified) 35 [d]	
Air voids content (%) [a, e]	CT 367		Design ± 2	
Percent of crushed particles [f] Coarse aggregate (% min.) Two fractured faces Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve) (% min) One fractured face	CT 205	1 per 5,000 tons or 1 per 5 business days, whichever is more	95 90	
Fine aggregate angularity [f, g] (% min.)	CT 234		45	
Los Angeles Rattler [f] Loss at 100 rev. (% max.) Loss at 500 rev. (% max.)	CT 211	As necessary and designated in the QCP. At least once per project	12 40	
Flat and elongated particles [f] (% max. by weight @ 5:1)	CT 235		10	
		Design air void content	4.0	5.0
Field compaction (% of max. theoretical density) [h, i, j]	CT 375	1 per 750 tons or any single location, whichever is less	92 – 97	91 – 96
Voids in mineral aggregate (% min.) 1/2" grading 3/4" grading 1" grading [k] with NMAS = 1" with NMAS = 3/4"	LP-2	1 per 4,000 tons or 1 per 2 business days, whichever is more	 14.0 13.0 12.0 13.0	 15.0 14.0 13.0 14.0
Voids filled with asphalt (%) 1/2" grading 3/4" grading 1" grading	LP-3		 65.0–75.0 65.0–75.0 65.0–75.0	 60.0–70.0 60.0–70.0 60.0–70.0
Dust proportion [l] (P200/Pbe)	LP-4	1 per 4,000 tons or 1 per 2 business days, whichever is more (Report Only)	0.6 – 1.3	0.6 – 1.3

Notes:

[a] Report the average of 3 tests from a single split sample.

[b] If the stability range is more than 12 points, prepare and test new briquettes.

[c] Follow CT 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.

[d] Modify CT 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply additional 500 tamps at 500 psi tamping pressure and 140 °F compaction temperature; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.

[e] Determine the bulk specific gravity of each lab-compacted briquette under CT 308, Method A. Determine theoretical maximum specific gravity under CT 309. Calculate the air voids content of each specimen using CT 309 and LP 1. Modify CT 367, Paragraph C5, to use the design air voids content specified under "Hot Mix Asphalt Type C Mixture."

[f] Aggregate must comply with the quality specifications before it is treated with lime. During lime treatment except for dry lime on damp aggregate treatment at continuous mixing plants, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Prepare and test 3 samples from a single split sample for aggregate quality at the frequency specified during lime treatment and report test results as the average of the 3 tests.

[g] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[h] Determine field compaction for any of the following conditions:

1. 1/2-inch aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch or 1-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[i] Use California Test 375 to determine field compaction, except use:

1. In-place density measurements using the method specified in your QC plan instead of using the nuclear gage in Part 4 of California Test 375.
2. California Test 309 to determine maximum theoretical density instead of calculating test maximum density in Part 5 of California Test 375.

[j] For Standard process, take and average 3 cores per 250 tons of HMA placed
[k] Minimum VMA dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.
[l] Asphalt content based on dry weight of aggregate.

With the acceptance testing for the specified construction process, the Engineer samples and tests the following quality characteristics:

HMA Type C Acceptance

Quality Characteristic	Test Method	Requirement	
Asphalt binder content (%)	CT 379 or 382	JMF ± 0.40	
Stabilometer Value [a, b,] (min.)	CT 366	37 [c] (Modified) 35 [d]	
Air voids content (%) [a, e]	CT 367	Design ± 2	
Percent of crushed particles [f] Coarse aggregate (% min.) Two fractured faces Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve) (% min) One fractured face	CT 205	 95 90	
Fine aggregate angularity [f, g] (% min.)	CT 234	45	
Los Angeles Rattler [f] Loss at 100 rev. (% max.) Loss at 500 rev. (% max.)	CT 211	 12 40	
Flat and elongated particles [f] (% max. by weight @ 5:1)	CT 235	 10	
	Design air void content	4.0	5.0
Field compaction [h, i, j] (% of max. theoretical density)	CT 375	92 – 97	91 – 96
Voids in mineral aggregate (% min.) 1/2" grading 3/4" grading 1" grading [k] with NMAS = 1" with NMAS = 3/4"	LP-2	 14.0 13.0 12.0 13.0	 15.0 14.0 13.0 14.0
Voids filled with asphalt (%) 1/2" grading 3/4" grading 1" grading	LP-3	 65.0–75.0 65.0–75.0 65.0–75.0	 60.0–70.0 60.0–70.0 60.0–70.0
Dust proportion [l] (P200/Pbe)	LP-4	0.6 – 1.3 Report Only	

Notes:

[a] The Engineer reports the average of 3 tests from a single split sample.

[b] If the stability range is more than 12 points, the Engineer prepares and tests new briquettes.

[c] The Engineer follows CT 366 modified as: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.

[d] Modified CT 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply additional 500 tamps at 500 psi tamping pressure and 140 °F compaction temperature; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.

[e] The Engineer determines the bulk specific gravity of each lab-compacted briquette under CT 308, Method A. The Engineer determines theoretical maximum specific gravity under CT 309. The Engineer calculates the air voids content of each specimen using CT 309 and LP 1. The Engineer modifies CT 367, Paragraph C5, to use the design air voids content specified under "Hot Mix Asphalt Type C Mixture."

[f] Aggregate must comply with the quality specifications before it is treated with lime. During lime treatment, except for dry lime on damp aggregate treatment at continuous mixing plants; the Engineer samples coarse and fine aggregate from individual stockpiles, combines aggregate in the JMF proportions, and prepares and tests 3 samples from a single split sample for aggregate quality at the frequency specified during lime treatment and report test results as the average of the 3 tests.

[g] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

[h] The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch or 1-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[i] California Test 375 is used to determine field compaction, except the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core instead of using the nuclear gauge in Part 4 of California Test 375.
2. California Test 309 to determine maximum theoretical density instead of calculating test maximum density of California Test 375, Part D.

[j] For Standard process, the Engineer takes and averages 3 cores per 250 tons of HMA placed.

[k] Minimum VMA dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.

[l] Asphalt content based on dry weight of aggregate.

The Engineer tests the 3 density cores you take from every 250 tons of HMA production. The Engineer determines the percent of maximum theoretical density for each density core by determining the density core's density and dividing by the maximum theoretical density. The Engineer determines the percent of maximum theoretical density for every 250 tons of HMA production by determining the average of the 3 density cores.

The Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA if any of the following applies:

1. 1/2-inch aggregate grading is used and the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15.
2. 3/4-inch or 1-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot and any layer is less than 0.20 foot.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type C must be PG 64-28 PM.

Aggregate

The aggregate for HMA Type C must comply with the 1- inch grading.

Choose a sieve size target value (TV) within each target value limit presented in the following table:

Aggregate Gradation
(Percentage Passing)
HMA Type C

1–inch HMA Type C

Sieve Sizes	Target Value Limits	Allowable Tolerance
1"	100	—
3/4"	88 - 93	TV ±5
1/2"	72 - 85	TV ±6
3/8”	55 - 70	TV ±6
No. 4	35 - 52	TV ±7
No. 8	22 - 40	TV ±5
No. 30	8 - 24	TV ±4
No. 50	5 - 18	TV ±4
No. 200	3 - 7	TV ±2

3/4–inch HMA Type C

Sieve Sizes	Target Value Limits	Allowable Tolerance
1"	100	—
3/4"	90 - 95	TV ±5
1/2"	60 - 75	TV ±6
No. 4	35 - 52	TV ±7
No. 8	22 - 36	TV ±5
No. 30	8 - 18	TV ±4
No. 200	3 - 7	TV ±2

1/2–inch HMA Type C

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/4"	100	—
1/2"	90 - 98	TV ±6
3/8"	64 - 84	TV ±6
No. 4	42 - 57	TV ±7
No. 8	29 - 39	TV ±5
No. 30	13 - 19	TV ±4
No. 200	3 - 7	TV ±2

Before the addition of asphalt binder and lime treatment, aggregate must comply with:

Aggregate Quality

Quality Characteristic	Test Method	Requirement
Percent of crushed particles	CT 205	
Coarse aggregate (% min.)		
Two fractured faces		95
Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve.) (% min)		
One fractured face		90
Los Angeles Rattler (% Max.)	CT 211	
Loss at 100 rev.		12
Loss at 500 rev.		40
Sand equivalent [a] (min.)	CT 217	47
Fine aggregate angularity [b] (% min.)	CT 234	45
Flat and elongated particles (% max. by weight @ 5:1).)	CT 235	10

Note:
[a] Reported value must be the average of 3 tests from a single sample.
[b] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock and gravel.

If lime treatment is required, sample coarse and fine aggregate from individual stockpiles during lime treatment except for dry lime on damp aggregate at continuous mixing plants. Combine aggregate in the JMF proportions.

Hot Mix Asphalt Type C Mixture

During mix design, determine the optimum binder content (OBC) at 5.0 percent air voids content.
Determine the proposed JMF from a mix design that complies with:

Hot Mix Asphalt Mix Design Requirements

Quality Characteristic	Test Method or Lab Procedure	Requirement	
Design air voids content (%)		4.0	5.0
Air voids content [a] (%)	CT 367	4.0	5.0
Voids in mineral aggregate (% min.) [b]	LP-2		
1/2" grading		14.0	15.0
3/4" grading		13.0	14.0
1" grading			
with NMAS = 1"		12.0	13.0
with NMAS = 3/4"		13.0	14.0
Voids filled with asphalt (%)	LP-3		
1/2" grading		65.0 – 75.0	60.0 – 70.0
3/4" grading		65.0 – 75.0	60.0 – 70.0
1" grading		65.0 – 75.0	60.0 – 70.0
Dust proportion [c] (P200/Pbe)	LP-4	0.6 – 1.3	0.6 – 1.3
Stabilometer value (min.) [d]	CT 366	37 [e] (Modified) 35 [f]	37 [e] (Modified) 35 [f]

Notes:
[a] Calculate the air voids content of each specimen using CT 309 and LP-1. Modify CT 367, Paragraph C5, to use the exact air voids content specified in the selection of OBC.
[b] Minimum VMA is dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.
[c] Asphalt content based on dry weight of aggregate
[d] Modify CT 304, Part 2.B.2.c: "After compaction in the compactor, cool to 140 °± 5 °F by allowing the briquettes to cool at room temperature for 0.5-hour, then place the briquettes in the oven at 140 °F for a minimum of 2 hours and not more than 3 hours."
[e] Follow CT 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply 12,600 lb leveling load; and perform stabilometer test at 140 °F.
[f] Modify CT 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply additional 500 tamps at 500 psi; apply 12,600 lb leveling load; and perform stabilometer test at 140 °F.

CONSTRUCTION

Pave HMA Type C in maximum 0.45-foot thick compacted layers.

Before opening the lane to traffic, pave shoulders and median borders adjacent to a lane being paved.

Place HMA Type C on adjacent traveled way lanes so that at the end of each work shift, the distance between the ends of HMA Type C layers on adjacent lanes is between 5 feet and 10 feet. Place additional HMA Type C along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional HMA Type C to form temporary conforms. You may place kraft paper or another approved bond breaker under the conform tapers to facilitate the taper removal when paving operations resume.

Place additional HMA Type C along the pavement's edge to conform to road connections and private drives. Hand rake, if necessary, and compact the additional HMA Type C to form a smooth conform taper.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 4-inch or 6-inch diameter data cores:

1. At the beginning, end, and every 1/2 mile within the paving limits of each route on the project
2. After all paving is complete
3. From the center of the specified lane

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material
2. Crumbled or cracked stabilized material
3. Sandy or clayey soil

PAYMENT

The contract lump sum price paid for data core includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in data coring, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.44 HOT MIX ASPHALT (MISCELLANEOUS AREAS)

GENERAL

Summary

This work includes producing hot mix asphalt (HMA) and placing it on miscellaneous areas.
Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

MEASUREMENT AND PAYMENT

If there is a contract item for place hot mix asphalt (miscellaneous area) paid for by the square yard, this item is limited to the areas listed on the plans and is in addition to the contract items for the materials involved.

10-1.45 JOINTED PLAIN CONCRETE PAVEMENT

GENERAL

Summary

This work includes constructing jointed plain concrete pavement.
Comply with Section 40, "Concrete Pavement," of the Standard Specifications.

Submittals

Fabricate test specimens from a single sample of concrete for coefficient of thermal expansion testing under AASHTO T 336. Submit 4 test specimens for assurance testing.
Submit all your coefficient of thermal expansion data at the Web site:

http://169.237.179.13/cte/

For rejected test strips, submit a plan for changed materials, methods, or equipment before constructing additional test strips.

Quality Control and Assurance

General

Perform coefficient of thermal expansion testing under AASHTO T 336 at a frequency of 1 test for each 5,000 cubic yards of paving but not less than 1 test for projects with less than 5,000 cubic yards of JCPC. This test is not going to be used for acceptance.

Prepaving Conference

Meet with the Engineer at a prepaving conference at a mutually agreed time and place. Discuss methods of performing the production and paving work.
Prepaving conference attendees must sign an attendance sheet provided by the Engineer. The prepaving conference must be attended by your:

1. Project superintendent
2. Quality control manager
3. Paving construction foreman

4. Subcontractor's workers including:

    4.1. Foremen
    4.2. Concrete plant manager
    4.3. Concrete plant operator
    4.4. Personnel performing saw cutting and joint sealing

Do not start paving activities including test strips until the listed personnel have attended a prepaving conference.

Test Strips

The first paving activity must be to construct a test strip:

1. 700 to 1,000 feet long
2. Same width as the planned paving
3. With the same equipment used for the planned paving

The Engineer evaluates the test strip for compliance with the specifications for Engineer's acceptance.

The Engineer selects from 6 to 12 core locations for dowel bars and up to 6 locations for tie bars per test strip.

If you use mechanical dowel bar inserters, the test strip must demonstrate they do not leave voids, segregations, or surface irregularities such as depressions, dips, or high areas.

Allow the Engineer 3 days to evaluate the test strip for:

1. Smoothness
2. Dowel bar and tie bar alignment
3. Thickness
4. Final finishing except coefficient of friction

During the 3-day evaluation, the Engineer rejects a test strip if:

1. Surface varies more than 0.02 foot from a 12-foot straightedge's lower edge
2. Wheel path's individual high points are greater than 0.025 foot in 25 feet
3. Dowel bars do not comply with specified placement tolerances
4. Concrete pavement thickness deficiency is greater than 0.05 foot
5. Final finishing does not comply with the specifications except coefficient of friction

Remove the test strip if the Engineer rejects it for noncompliance with the specifications for dowel bar alignment or thickness. Dispose of rejected test strip material under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

If the Engineer rejects the test strip for noncompliance with the smoothness or final finishing specifications except coefficient of friction, you may grind the test strip into compliance if you intend to leave it as part of the paving.

If the Engineer does not reject the test strip during the 3-day evaluation, you may begin production paving while the Engineer continues to evaluate the test strip for compliance with the other specifications. If the Engineer rejects the test strip for noncompliance with the other specifications, stop production paving until you construct a test strip the Engineer accepts.

Construct additional test strips until the Engineer accepts one.

Construct additional test strips if you:

1. Propose different paving equipment including:

    1.1. Paver
    1.2. Dowel bar inserter
    1.3. Tie bar inserter
    1.4. Tining
    1.5. Curing equipment

2. Change concrete mix proportions

You may request authorization to eliminate the test strip if you use paving equipment and personnel from a Department project (1) for the same type of pavement and (2) completed within the past 12 months. Submit supporting documents and previous project information with your request.

MATERIALS

Concrete

For field qualification, perform coefficient of thermal expansion testing under AASHTO T 336.

Liquid Joint Sealant for Isolation Joints

Liquid joint sealant for isolation joints must be silicone.

Joint Seal

Use compression seal for transverse and longitudinal joint.
Install preformed compression seals in isolation joints.

Joint Filler for Isolation Joints

Joint filler for isolation joints must be Type 1.

Tack Coat

Tack coat must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

CONSTRUCTION

Tie Bar Spacing On Curves

If the curvature of a concrete pavement slab prevents equal spacing of tie bars to maintain the minimum clearance from transverse joints, space them from 15 to 18 inches.

Transverse Contraction Joints

Transverse contraction joints must be Type A1. If widening existing concrete pavement, do not construct transverse contraction joints to match the existing pavement's joint spacing or skew unless specified. Transverse joints in concrete pavement on a curve must be on a single straight line through the curve's radius point.

Longitudinal Contraction Joints

Longitudinal contraction joints must be Type A2.

Transition Joints With Hot Mix Asphalt

If a joint between concrete pavement and hot mix asphalt is specified, apply tack coat between the concrete pavement and hot mix asphalt.

Concrete Pavement Removal

When removing and replacing concrete, remove it to full depth and width.

Crack Treatment

If cracks form that do not extend to the full depth of a slab, treat the cracks with a high molecular weight methacrylate resin under "Concrete Pavement Crack Treatment."

Removal and Replacement of Slabs Without Bar Reinforcement

For full depth and partial length slab removal, saw cut the full depth and width.

Saw cut full slabs at the longitudinal and transverse joints. Saw cut partial slabs at joints and where the Engineer orders. You may make additional saw cuts within the removal area to facilitate slab removal or to prevent binding of the saw cut at the removal area's edge. Saw cut perpendicular to the slab surface.

Use slab lifting equipment with lifting devices that attach to the slab. After lifting the slab, paint the cut ends of dowels and tie bars.

Construct transverse and longitudinal construction joints between the new slab and existing concrete using dowel bars. For longitudinal joints, offset dowel bar holes from original tie bars by 3 inches. For transverse joints, offset dowel bars holes from the original dowel bars by 3 inches.

Drill holes and use chemical adhesive to bond the dowel bars to the existing concrete. Use an automated dowel bar drilling machine. Holes must be at least 1/8-inch greater than the dowel bar diameter. Clean the holes in compliance with the chemical adhesive manufacturer's instructions. Holes must be dry when you place chemical adhesive.

Immediately after inserting dowel bars into the chemical adhesive-filled holes, support the dowel bars and leave them undisturbed for the minimum cure time recommended by the chemical adhesive manufacturer.

Clean the faces of joints and underlying base from loose material and contaminants. Coat the faces with a double application of pigmented curing compound under Section 28-1.07, "Curing," of the Standard Specifications. For partial slab replacements, place preformed sponge rubber expansion joint filler at new transverse joints in compliance with ASTM D 1752.

MEASUREMENT AND PAYMENT

If the Engineer accepts a test strip and it remains as part of the paving surface, the test strip is measured and paid for as jointed plain concrete pavement, seal pavement joint, and seal isolation joint as the case may be.

The contract item for concrete pavement transition panel as designated in the Verified Bid Item List is measured by the cubic yard. The Engineer calculates the pay quantity volume based on the plan dimensions. The Engineer does not measure concrete pavement placed outside those dimensions unless it was ordered by the Engineer

The contract price paid per cubic yard for concrete pavement transition panel as designated in the Verified Bid Item List includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the concrete pavement, complete in place including bar reinforcement, tie bars, and dowel bars as shown on the plans and as specified in these specifications and the special provisions, and as directed by the Engineer.

Full compensation for providing a facility for and attending the prepaving conference is included in the contract price paid per cubic yard for jointed plain concrete pavement and no additional compensation is allowed therefor.

Full compensation for applying tack coat at transverse transition joints and end anchors is included in the contract price paid per cubic yard for jointed plain concrete pavement and no separate payment is made therefor.

If the curvature of a slab affects tie bar spacing and additional tie bars are required, they are included in the contract price paid per cubic yard for jointed plain concrete pavement and no additional compensation is allowed therefor.

10-1.46 CONCRETE PAVEMENT CRACK TREATMENT

GENERAL

Summary

This work includes applying a high molecular weight methacrylate (HMWM) resin system to concrete pavement surface cracks that do not extend the full slab depth. HMWM resin system consists of:

1. HMWM resin
2. Promoter
3. Initiator

Submittals

Before starting crack treatment, submit the following plans under the specifications for working drawings in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications:

1. Public safety plan for HMWM resin system
2. Placement plan for the construction activity
3. Material Safety Data Sheet for each component of the HMWM resin system

The public safety plan and the placement plan must identify materials, equipment, and methods to be used.

The public safety plan must include details for:

1. Shipping
2. Storage
3. Handling
4. Disposal of residual HMWM and the containers

The placement plan must include:

1. Crack treatment schedule including coefficient of friction testing
2. Methods and materials including:

    2.1. Equipment description for HMWM resin system application
    2.2. Equipment description for sand application
    2.3. Manufacturer's gel time range and final cure time for resin

Revise rejected plans and resubmit. With each plan rejection, the Engineer gives revision directions including detailed comments in writing. The Engineer notifies you of a plan's acceptance or rejection within 2 weeks of receiving that plan.

Submit HMWM samples 20 days before use.

Quality Control and Assurance

Before starting crack treatment, treat a 500-square foot test area within the project limits and at a location accepted by the Engineer. Use test areas outside the traveled way if available. Weather and pavement conditions during the test crack treatment must be similar to those expected during production crack treatment. Use equipment during testing similar to those to be used during crack treatment.

For the test area and during crack treatment, use test tiles for evaluating the HMWM resin system cure time. Coat at least one 4" x 4" smooth glazed tile for each batch of HMWM resin system. Place the coated tile adjacent to the area being treated. Do not apply sand to the test tiles.

Do not start crack treatment until the Engineer accepts the test area.

The Engineer accepts a treated area if:

1. The corresponding test tiles are dry to the touch
2. The treated surface is tack-free and non-oily
3. The sand cover adheres enough to resist hand brushing
4. You remove excess sand
5. The coefficient of friction is at least 0.30 determined under California Test 342

MATERIALS

Promoter and initiator in the HMWM resin system must be compatible. The HMWM resin may be a prepromoted resin consisting of promoter and resin mixed together before filling containers. Identify prepromoted resin on the container label.

Adjust the gel time to compensate for temperature changes throughout the application.

HMWM resin must comply with:

High Molecular Weight Methacrylate Resin

Property	Requirement	Test Method
Viscosity [a]	25 cP, maximum, (Brookfield RVT with UL adapter, 50 RPM at 77 °F	ASTM D 2196
Specific Gravity [a]	0.90 minimum, at 77 °F	ASTM D 1475
Flash Point [a]	180 °F, minimum	ASTM D 3278
Vapor Pressure [a]	1.0 mm Hg, maximum, at 77 °F	ASTM D 323
Tack-free Time	400 minutes, maximum, at 77 °F	Specimen prepared under California Test 551
Volatile Content [a]	30 percent, maximum	ASTM D 2369
PCC Saturated Surface-Dry Bond Strength	500 psi, minimum at 24 hours and 77 °F±2 °F	California Test 551

Note:
[a] Test must be performed before adding initiator.

Sand must be commercial quality dry blast sand. At least 95 percent of the sand must pass the No. 8 sieve and at least 95 percent must be retained on the No. 20 sieve.

CONSTRUCTION

Apply HMWM resin system after any grinding.

Prevent deleterious material such as oil from being deposited on the pavement by equipment with devices such as traps, filters, and drip pans.

Before applying HMWM resin system, clean the pavement surface by abrasive blasting and blow loose material from visible cracks with high-pressure air. Remove concrete curing seals from the pavement to be treated. The pavement must be dry when blast cleaning is performed. If the pavement surface becomes contaminated before applying the HMWM resin system, clean the pavement surface by abrasive blasting.

If performing abrasive blasting within 10 feet of a lane occupied by traffic, operate abrasive blasting equipment with a concurrently operating vacuum attachment.

During pavement treatment, protect pavement joints, working cracks, and surfaces not to be treated. Block drains and openings that convey water to water ways.

The machine applying HMWM resin system must combine the components by either static in-line mixers or by external intersecting spray fans. The pump pressure at the spray bars must not cause atomization. Do not use compressed air to produce the spray. Use a shroud to enclose the spray bar apparatus.

You may apply HMWM resin system manually to prevent overspray onto adjacent traffic. If applying resin manually, limit the batch quantity of HMWM resin system to 5 gallons.

Do not apply HMWM resin system in more than 90 percent relative humidity. The prepared area must be dry and the surface temperature must be from 50 to 100 °F when the HMWM resin system is applied. Apply HMWM resin system at a rate of 90 square feet per gallon.

Protect existing facilities from the HMWM resin system application. Repair or replace existing facilities contaminated with HMWM resin system at your expense.

Flood the treatment area with HMWM resin system, penetrating the pavement and cracks. Apply HMWM resin system within 5 minutes after complete mixing. Mixed HMWM resin system viscosity must not increase. Redistribute excess material with squeegees or brooms within 10 minutes of application. Remove excess material from tined grooves.

Wait at least 20 minutes after applying HMWM resin system before applying sand. Apply sand at a rate of approximately 2 pounds per square yard or until refusal. Remove excess sand by vacuuming or sweeping.

Do not allow traffic on the treated surface until:

1. Treated surface is tack-free and non-oily
2. Sand cover adheres enough to resist hand brushing

3. Excess sand is removed
4. Coefficient of friction is at least 0.30 under California Test 342

PAYMENT

Full compensation for concrete pavement crack treatment is included in the contract price paid per cubic yard for concrete pavement as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.47 GRIND CONCRETE PAVEMENT (WEIGH IN MOTION)

Grinding portland cement concrete shall conform to the provisions in Section 42-2, "Grinding," of the Standard Specifications and these special provisions.

Grinding shall be performed at the following locations:

A. "C" Line, from station 43+23.00 to station 46+23.00
B. "C" line, from station 64+50.00 to station 67+75.00

The finished ground surface of the concrete pavement will not be profiled and the Profile Index requirements shall not apply.

The ground surface will be tested with a 12-foot ±2-1/2 inches long straightedge at locations determined by the Engineer. When the straightedge is laid on the finished pavement in a direction parallel with centerline, or perpendicular to centerline, the surface shall not vary more than 1/8 inch from the lower edge of the straightedge. Additional grinding shall be performed, if necessary, to meet the straightedge requirements.

Full compensation for additional grinding necessary to conform to the straightedge requirements shall be considered as included in the contract price paid per square yard for grind existing concrete pavement and no additional compensation will be allowed therefor.

10-1.48 DISPOSAL OF PORTLAND CEMENT CONCRETE (PCC) PAVEMENT GROOVING AND GRINDING RESIDUES

Disposal of portland cement concrete (PCC) pavement grooving and grinding residues shall be in conformance with the provisions in Section 42, "Groove and Grind Pavement," of the Standard Specifications and these special provisions.

The Contractor shall include water pollution control measures to address the handling of the grinding pavement residue within the Storm Water Pollution Prevention Plan or Water Pollution Control Program, as specified in "Water Pollution Control" of these special provisions.

Temporary storage of PCC pavement grooving and grinding residues shall not be allowed within the highway right of way. The Contractor may transport liquid PCC pavement grooving and grinding residues to an offsite drying location if the Engineer provides written approval. The offsite drying location shall be identified and protected in conformance with "Water Pollution Control" of these special provisions.

A Materials Information Handout is not available for disposal of PCC pavement grooving or grinding residues. The Contractor shall dispose of PCC pavement grooving and grinding residues in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside of the Right of Way," of the Standard Specifications. The facilities listed below were permitted by Regional Water Quality Control Board (RWQCB) or other agencies that may accept PCC pavement grinding and grooving residues as of July 1, 2004. If the Contractor is planning to use one of these sites, the Contractor shall determine if the facility has a current permit to accept PCC pavement grooving and grinding residues and if the facility can accept the waste at the time of generation.

Site Name	Location	Telephone	Waste Types / Restrictions
Clean Harbors Environmental Services Buttonwillow	2500 West Lokern Road Buttonwillow, CA	(562) 432-5445	Hazardous Solids and Non-Hazardous Liquids and Solids
Clean Harbors Environmental Services San Jose	1021 Berryessa San Jose, CA	(408) 451-5000	Hazardous and Non-Hazardous Liquids
Crosby & Overton, Inc.	1610 W. 17th Street Long Beach, CA	(562) 432-5445	Hazardous and Non-Hazardous Liquids
D/K Environmental	3650 East 26th Street Vernon, CA	(323) 268-5056	Hazardous and Non-Hazardous Liquids and Solids
DeMenno-Kerdoon	200 N. Alameda Street Compton, CA	(323) 268-5057 (310) 537-7100	Hazardous and Non-Hazardous Liquids and Solids
Filter Recycling Services, Inc.	180 West Monte Avenue Rialto, CA	(909) 424-1630	Hazardous and Non-Hazardous Liquids
K-Pure Water Works	8910 Rochester Ave Rancho Cucamonga, CA	(909) 476-2308	Non-Hazardous Liquids
Liquid Waste Management McKittrick	56533 Highway 58 McKittrick, CA	(559) 386-6104	Non-Hazardous Liquids and Solids
Onyx Environmental Services LLC	1704 W. First Street Azusa, CA	(626) 334-5117	Hazardous and Non-Hazardous Liquids and Solids
Phibro-Tech, Inc.	8851 Dice Road Santa Fe Springs, CA	(562) 698-8036	Hazardous and Non-Hazardous Liquids and Solids
Romic Environmental Technologies Corporation	2081 Bay Road East Palo Alto, CA	(650) 324-1638	Hazardous and Non-Hazardous Liquids
Seaport Environmental	700 Seaport Boulevard Redwood City, CA	(650) 364-8154	Non-Hazardous Liquids
Southwest Treatment Systems, Inc.	4120 Bandini Boulevard Los Angeles, CA	(800) 900-3366	Non-Hazardous Liquids
US Filter Recovery Services, Inc.	5375 S. Boyle Avenue Vernon, CA	(323) 277-1495	Hazardous and Non-Hazardous Liquids and Solids
Waste Management Kettleman City	35251 Old Skyline Road Kettleman City, CA	(559) 386-6104	Hazardous and Non-Hazardous Liquids and Solids

If the Contractor disposes of PCC pavement grooving and grinding residues at locations not listed above, the disposal shall be in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, and the following:

A. If the disposal facility is located within the State of California, the facility must be permitted by the RWQCB or other applicable agency, or the Contractor must obtain written approval from the RWQCB or other applicable agency.
B. If located outside of the State of California, the facility must be permitted by the applicable local, state, or federal agencies, or the Contractor must obtain written approval from the applicable local, state, or federal agencies.

The following shall be delivered to the Engineer at least 5 days before disposal of PCC pavement grooving and grinding residues:

A. The name, address, and telephone number of the disposal facility.
B. If the facility is not listed above:

    1. Copy of the facility's RWQCB or other applicable agency permit, or
    2. RWQCB's or other applicable agency's approval, or
    3. Copy of the applicable agency permit if the final disposal location is located outside of the State of California.

The Contractor shall deliver landfill receipts and weight ticket of disposal of residues from PCC pavement grooving and grinding to the Engineer within 5 days of completing of PCC pavement grooving and grinding activities.

The Contractor shall make all arrangements and agreements for the disposal at the time of bidding. Costs related to obtaining approval for disposal within the State of California from the RWQCB or other applicable agency, or the applicable agency if the disposal location is located outside of the State of California, shall be borne by the Contractor and no additional payment shall be made therefore. Full compensation for all costs involved in disposing of PCC pavement grooving or grinding residues as specified in this section, including all costs of handling, temporary storage, hauling and disposal fees, shall be considered as included in the price paid for the contract item of work involving PCC pavement grooving or grinding residues and no additional compensation will be allowed therefore.

10-1.49 PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Difficult pile installation is anticipated due to the presence of caving soils, cobbles and gravel.

CAST-IN-DRILLED-HOLE CONCRETE PILES

GENERAL

Summary

Cast-in-drilled-hole (CIDH) concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

The provisions of "Welding" of these special provisions shall not apply to temporary steel casings.

Definitions

dry hole:

1. Except for CIDH concrete piles specified as end bearing, a drilled hole that:

    1.1. Accumulates no more than 12 inches of water in the bottom of the drilled hole during a period of 1 hour without any pumping from the hole during the hour.

    1.2. Has no more than 3 inches of water in the bottom of the drilled hole immediately before placing concrete.

2. For CIDH concrete piles specified as end bearing, a drilled hole free of water without the use of pumps.

Submittals

Pile Installation Plan

The Contractor shall submit a pile installation plan to the Engineer for approval for all CIDH concrete piling. The pile installation plan shall be submitted at least 15 days before constructing CIDH concrete piling and shall include complete descriptions, details, and supporting calculations for the following:

A. Concrete mix design, certified test data, and trial batch reports.
B. Drilling or coring methods and equipment.
C. Proposed method for casing installation and removal when necessary.
D. Methods for placing, positioning, and supporting bar reinforcement. If plastic spacers are proposed for use, include the manufacturer's data and a sample of the plastic spacer.
E. Methods and equipment for determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
F. Methods and equipment for verifying that the bottom of the drilled hole is clean before placing concrete.
G. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

MATERIALS

Concrete

Concrete for portions of CIDH concrete piling to be formed shall contain not less than 675 pounds of cementitious material per cubic yard and shall contain 6.0±1.5 percent air entrainment in the freshly mixed concrete.

Aggregate Grading

The combined aggregate grading shall be either the 1-inch maximum grading, the 1/2-inch maximum grading, or the 3/8-inch maximum grading and shall conform to the requirements in Section 90-3, "Aggregate Gradings," of the Standard Specifications.

Spacers

Spacers shall conform to Section 52-1.07, "Placing," of the Standard Specifications, except plastic spacers may be used.

Plastic spacers shall conform to Sections 3.4 and 3.5 of the Concrete Reinforcing Steel Institute's "Manual of Standard Practice" and shall have at least 25 percent of their gross plane area perforated to compensate for the difference in the coefficient of thermal expansion between the plastic and concrete. Plastic spacers shall be commercial quality.

CONSTRUCTION

General

Portions of CIDH concrete piling shown on the plans to be formed shall be formed and finished in conformance with the provisions for concrete structures in Section 51, "Concrete Structures," of the Standard Specifications.

Unless otherwise shown on the plans, the bar reinforcing steel cage shall have at least 3 inches of clear cover measured from the outside of the cage to the sides of the hole or casing.

Spacers shall be placed at least 5 inches clear from any inspection tubes. Plastic spacers shall be placed around the circumference of the cage and at intervals along the length of the cage, as recommended by the manufacturer of the plastic spacer.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in drilling or coring holes, disposing of the material resulting from drilling or coring holes, furnishing and placing concrete, test batches, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, and redrilling through concrete shall be considered as included in the contract prices paid per linear foot for cast-in-drilled-hole concrete piling of the types and sizes listed in the Engineer's Estimate, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, as directed by the Engineer, and no additional compensation will be allowed therefor.

10-1.50 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

GENERAL

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

FALSEWORK

Falsework shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

The Contractor's engineer who signs the falsework drawings shall also certify in writing that the falsework is constructed in conformance with the approved drawings and the contract specifications prior to placing concrete. This certification shall include performing any testing necessary to verify the ability of the falsework members to sustain the stresses required by the falsework design. The engineer who signs the drawings may designate a representative to perform this certification. Where falsework contains openings for railroads, vehicular traffic, or pedestrians, the designated representative shall be qualified to perform this work, shall have at least 3 years of

combined experience in falsework design or supervising falsework construction, and shall be registered as a Civil Engineer in the State of California. For other falsework, the designated representative shall be qualified to perform this work and shall have at least 3 years of combined experience in falsework design or supervising falsework construction. The Contractor shall certify the experience of the designated representative in writing and provide supporting documentation demonstrating the required experience if requested by the Engineer.

Welding and Nondestructive Testing

Welding of steel members, except for previously welded splices and except for when fillet welds are used where load demands are less than or equal to 1,000 pounds per inch for each 1/8 inch of fillet weld, shall conform to AWS D1.1 or other recognized welding standard. The welding standard to be utilized shall be specified by the Contractor on the working drawings. Previously welded splices for falsework members are defined as splices made prior to the member being shipped to the project site.

Splices made by field welding of steel beams at the project site shall undergo nondestructive testing (NDT). At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for each field weld and any repair made to a previously welded splice in a steel beam. Testing shall be performed at locations selected by the Contractor. The length of a splice weld where NDT is to be performed, shall be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass shall be ground smooth at the locations to be tested. The acceptance criteria shall conform to the requirements of AWS D1.1, Section 6, for cyclically loaded nontubular connections subject to tensile stress. If repairs are required in a portion of the weld, additional NDT shall be performed on the repaired sections. The NDT method chosen shall be used for an entire splice evaluation including any required repairs.

For all field welded splices, the Contractor shall furnish to the Engineer a letter of certification which certifies that all welding and NDT, including visual inspection, are in conformance with the specifications and the welding standard shown on the approved working drawings. This letter of certification shall be signed by an engineer who is registered as a Civil Engineer in the State of California and shall be provided prior to placing any concrete for which the falsework is being erected to support.

For previously welded splices, the Contractor shall determine and perform all necessary testing and inspection required to certify the ability of the falsework members to sustain the stresses required by the falsework design. This welding certification shall (1) itemize the testing and inspection methods used, (2) include the tracking and identifying documents for previously welded members, (3) be signed by an engineer who is registered as a Civil Engineer in the State of California, (4) and shall be provided prior to erecting the members.

MEASUREMENT AND PAYMENT

Measurement and payment for concrete in structures shall conform to the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for public notification and airborne monitoring for deck crack treatment shall be considered as included in the contract price paid per cubic yard for structural concrete, bridge, and no additional compensation will be allowed therefor.

10-1.51 STRUCTURE APPROACH SLABS (TYPE N)

GENERAL

Summary

This work includes constructing reinforced concrete approach slabs, structure approach drainage systems, and treated permeable base.

Reinforced concrete approach slabs must comply with Section 51, "Concrete Structures," of the Standard Specifications.

Submittals

Furnish a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the geocomposite drain certifying that the drain complies with these special provisions. The Certificate of Compliance must be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. The flow capability graph must be stamped with the verification of an independent testing laboratory.

Notify the Engineer of the type of treated permeable base to be furnished at least 30 days before the start of placement. Once you have notified the Engineer of the selection, the type to be furnished must not be changed without a prior written request to do so and approval thereof by the Engineer.

Notify the Engineer of the source of woven tape fabric at least 45 days before use.

MATERIALS

Concrete

Concrete for structure approach slabs must contain not less than 675 pounds of cementitious material per cubic yard and must either:

1. Cure for not less than 5 days before opening to public traffic, or
2. Comply with "Rapid Strength Concrete for Structures" of these special provisions.

Concrete must comply with "Freezing Condition Requirements" of these special provisions.

Drainage Pads

Concrete for use in drainage pads must be minor concrete.

Geocomposite Drain

Geocomposite drain must consist of a manufactured core not less than 0.25 inch thick nor more than 2 inches thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain must produce a flow rate through the drainage void of at least 2 gallons per minute per foot of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 3,500 psf.

The manufactured core must be one of the following:

1. Preformed grid of embossed plastic
2. Mat of random shapes of plastic fibers
3. Drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels
4. System of plastic pillars and interconnections forming a semirigid mat

The core material and filter fabric must be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric must be integrally bonded to the side of the core material with the drainage void.

Filter Fabric

Filter fabric must comply with the specifications for Class A filter fabric in Section 88-1.02, "Filtration," of the Standard Specifications.

Plastic Pipe

Plastic pipe shall conform to the provisions for pipe for edge drains and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.

Treated Permeable Base

Treated permeable base under structure approach slabs must be an asphalt treated permeable base or a cement treated permeable base as specified in Section 29, "Treated Permeable Bases," of the Standard Specifications.

Miscellaneous Materials

Steel components of abutment ties, including plates, nuts, washers, and rods, must comply with Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Steel angles, plates, and bars at the concrete barrier joints must comply with Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

Hardboard and expanded polystyrene must comply with Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers," of the Standard Specifications.

Building paper must be commercial quality 30-pound asphalt felt.

PVC conduit used to encase the abutment tie rod must be commercial quality.

CONSTRUCTION

Geocomposite Drain

Install the geocomposite drain with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side must overlap a minimum of 3 inches at all joints and wrap around the exterior edges a

minimum of 3 inches beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wraparound at edges, the added fabric must overlap at least 6 inches and be attached to the fabric on the geocomposite drain.

Place core material manufactured from impermeable plastic sheeting having non-connecting corrugations with the corrugations approximately perpendicular to the drainage collection system.

If the fabric on the geocomposite drain is torn or punctured, replace the damaged section completely or repair it by placing a piece of fabric that is large enough to cover the damaged area and provide a 6-inch overlap.

If asphalt treated permeable base is placed around the slotted plastic pipe at the bottom of the geocomposite drain, it must be placed at a temperature of not less than 180 °F nor more than 230 °F.

Filter Fabric

Place filter fabric immediately after grading and compacting the subgrade to receive the filter fabric.

Align, handle, and place filter fabric in a wrinkle-free manner under the manufacturer's recommendations.

Adjacent borders of the filter fabric must be overlapped from 12 inches to 18 inches or stitched. The preceding roll must overlap the following roll in the direction the material is being spread or must be stitched. When the fabric is joined by stitching, it must be stitched with yarn of a contrasting color. The size and composition of the yarn must be as recommended by the fabric manufacturer. The number of stitches per 1 inch of seam must be 5 to 7.

Equipment or vehicles must not be operated or driven directly on the filter fabric.

Woven Tape Fabric

Woven tape fabric to be placed between the treated permeable base and the approach slab must be a fabric made of woven strips or tapes and shall conform to the following:

Property	ASTM Designation	Requirement
Weight, ounces per square yard, min.	D 3776	3
Grab Tensile Strength, pounds, min.	D 4632	50
Elongation, percent, max.	D 4632	35
Toughness, pounds, min. (Percent elongation times grab tensile strength)	----	1,200

Woven tape fabric must be treated to provide a minimum of 70 percent breaking strength retention after 500 hours exposure when tested under ASTM D 4355.

Treated Permeable Base

Construct treated permeable base under Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

Place asphalt treated permeable base at a temperature of not less than 200 °F nor more than 250 °F. Do not use material stored in excess of 2 hours in the work.

Asphalt treated permeable base may be spread in 1 layer. Compact the base with a vibrating shoe type compactor or a roller weighing at least 1.5 tons but not more than 5 tons. Begin compacting the base as soon as the mixture has cooled sufficiently to support the weight of the equipment without undue displacement.

Cement treated permeable base may be spread in 1 layer. Compact the base with a vibrating shoe type compactor or with a steel-drum roller weighing at least 1.5 tons but not more than 5 tons. Compaction must begin within one-half hour of spreading and must consist of 2 complete coverages of the cement treated permeable base.

Finishing Approach Slabs

Finish and treat the top surface of approach slabs under Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications. Edges of slabs must be edger finished.

Cure approach slabs with pigmented curing compound (1) under the specifications for curing structures in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

Sealing Joints

Type AL joint seals must comply with Section 51-1.12F, "Sealed Joints," of the Standard Specifications. The sealant may be mixed by hand-held power-driven agitators and placed by hand methods.

The pourable seal between the steel angle and concrete barrier must comply with the requirements for Type A and AL seals in Section 51-1.12F(3), "Materials and Installation," of the Standard Specifications.

The sealant may be mixed by hand-held power-driven agitators and placed by hand methods. Immediately before placing the seal, thoroughly clean the joint, including abrasive blast cleaning of the concrete surfaces, so that all foreign material and concrete spillage are removed from all joint surfaces. Joint surfaces must be dry at the time the seal is placed.

MEASUREMENT AND PAYMENT

Structural concrete, approach slab (Type N) will be measured and paid for in conformance with the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Full compensation for the structure approach drainage system including geocomposite drain, plastic pipe, and drainage pads, treated permeable base, filter fabric, woven tape fabric, miscellaneous metal, and pourable seals shall be considered as included in the contract price paid per cubic yard for structural concrete, approach slab of the type shown in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-1.52 SEALING JOINTS

Joints in concrete bridge decks and joints between concrete structures and concrete approach slabs must be sealed in conformance with the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans must be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes," of the Standard Specifications.

10-1.53 REINFORCEMENT

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The provisions in "Welding Quality Control" of these special provisions do not apply to resistance butt welding.

Reinforcement shown on the plans to be galvanized shall be galvanized in conformance with the requirements in ASTM Designation: A 767/A 767M, Class 1, except that chromating will not be required.

Within areas where galvanized reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be galvanized, plastic coated, or epoxy coated to prevent corrosion of the devices or damage to the galvanized reinforcement.

Galvanized surfaces that are abraded or damaged caused by shipping, handling, or installation shall be repaired as specified in Section 75-1.05, "Galvanizing," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Measurement and payment for reinforcement in structures shall conform to the provisions in Section 52-1.10, "Measurement," and Section 52-1.11, "Payment," of the Standard Specifications and these special provisions.

Full compensation for galvanizing steel reinforcement shall be considered as included in the prices paid for the various items of work involved and no additional compensation will be allowed therefor.

10-1.54 SIGN STRUCTURES

Sign structures and foundations for overhead signs shall conform to the provisions in Section 56-1, "Overhead Sign Structures," of the Standard Specifications, "Steel Structures" of these special provisions, and the following requirements.

Before commencing fabrication of sign structures, the Contractor shall submit 2 sets of working drawings to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall include sign panel dimensions, span lengths, post heights, anchorage layouts, proposed splice locations, a snugging and tensioning pattern for anchor bolts and high-strength bolted connections, and details for permanent steel anchor bolt templates. The working drawings shall be supplemented with a written quality control program that includes methods, equipment, and personnel necessary to satisfy the requirements specified herein.

Working drawings shall be 22" x 34" or 11" x 17" in size and each drawing and calculation sheet shall include the State assigned designations for the sign structure type and reference as shown on the contract plans, District-County-Route-Post Mile, and contract number.

The Engineer shall have 30 days to review the sign structure working drawings after a complete submittal has been received. No fabrication or installation of sign structures shall be performed until the working drawings are approved in writing by the Engineer.

Should the Engineer fail to complete the review within the time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the sign structure working drawings, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Steel bolts not designated on the plans as high strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

A permanent steel template shall be used to maintain the proper anchor bolt spacing.

One top nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt.

Flatness of surfaces for the following shall conform to the requirements in ASTM Designation: A 6/A 6M:

1. Base plates that are to come in contact with concrete, grout, or washers and leveling nuts
2. Plates in high-strength bolted connections

No holes shall be made in members unless the holes are shown on the plans or are approved in writing by the Engineer.

Longitudinal seam welds shall have 60 percent minimum penetration, except that within 6 inches of circumferential welds, longitudinal seam welds shall be complete joint penetration (CJP) groove welds. In addition, longitudinal seam welds on structures having telescopic pole segment splices shall be CJP groove welds on the female end for a length on each end equal to the designated slip fit splice length plus 6 inches.

Steel members used for overhead sign structures shall receive nondestructive testing (NDT) in conformance with AWS D1.1 and the following:

1.

Weld Location	Weld Type	Minimum Required NDT
Splice welds around the perimeter of tubular sections, poles, and arms.	CJP groove weld with backing ring	100% UT[a] or RT[b]
Longitudinal seam welds	CJP or PJP[c] groove weld	Random 25% MT[d]
Longitudinal seam welds within 6 inches of a circumferential splice.	CJP groove weld	100% UT or RT
Welds attaching base plates, flange plates, or pole or mast arm plates, to poles or arm tubes.	CJP groove weld with backing ring and reinforcing fillet	t> 3/16 inch: 100%UT and MT t< 3/16 inch: 100% MT after root weld pass and final weld pass t = pole or arm thickness
	External (top) fillet weld for socket-type connections	100% MT

a ultrasonic testing
b radiographic testing
c partial joint penetration
d magnetic particle testing

2. The acceptance and repair criteria for UT of welded joints where any of the members are less than 5/16 inch thick or where tubular sections are less than 13 inches in diameter shall conform to the requirements in AWS D1.1, Section 6.13.3.1. A written procedure approved by the Engineer shall be used when performing this UT. These written procedures shall conform to the requirements in AWS D1.1, Annex K. The acceptance and repair criteria for other welded joints receiving UT shall conform to the requirements in AWS D1.1, Section 6, Table 6.3 for cyclically loaded nontubular connections.
3. The acceptance and repair criteria for radiographic or real time image testing shall conform to the requirements of AWS D1.1 for tensile stress welds.
4. For longitudinal seam welds, the random locations for NDT will be selected by the Engineer. The cover pass shall be ground smooth at the locations to be tested. If repairs are required in a portion of a tested weld, the repaired portion shall receive NDT, and additional NDT shall be performed on untested portions of the weld. The additional NDT shall be performed on 25 percent of that longitudinal seam weld. After this additional NDT is performed and if more repairs are required, then that entire longitudinal seam weld shall receive NDT.

Circumferential welds and base plate to post welds may be repaired only one time without written permission from the Engineer.

Full compensation for furnishing anchor bolt templates and for testing of welds shall be considered as included in the contract price paid per pound for furnish sign structure, and no additional compensation will be allowed therefor.

10-1.55 ROADSIDE SIGNS

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWPA Use Category System: UC4A, Commodity Specification A or B.

10-1.56 INSTALL SIGN OVERLAY

Sign overlays shall be installed on existing signs as shown on the plans and in conformance with these special provisions.

The Contractor shall furnish sign overlay panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Self-plugging blind rivets for installing sign overlays shall have a 3/16" x 5/8" shank. A No. 10 drill shall be used for drilling the rivet holes. If the overlay is not pre-punched, maximum rivet spacing shall be 16 inches.

Installing sign overlays will be measured by the square foot.

The contract price paid per square foot for install sign overlay shall include full compensation for furnishing all labor, materials (except sign overlays), tools, equipment, and incidentals, and for doing all the work involved in installing sign overlay panels on existing signs (including fastening hardware), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.57 FURNISH SIGN

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign codes are available for review at:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm

Traffic Sign Specifications for signs referenced with Federal MUTCD sign codes can be found in Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at:

http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

Information on cross-referencing California sign codes with the Federal MUTCD sign codes is available at:

http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 25 feet. The face of each finished sign shall be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

QUALITY CONTROL FOR SIGNS

The requirements of "Quality Control for Signs" in this section shall not apply to construction area signs.

No later than 14 days before sign fabrication, the Contractor shall submit a written copy of the quality control plan for signs to the Engineer for review. The Engineer will have 10 days to review the quality control plan. Sign fabrication shall not begin until the Engineer approves the Contractor's quality control plan in writing. The Contractor shall submit to the Engineer at least 3 copies of the approved quality control plan. The quality control plan shall include, but not be limited to the following requirements:

A. Identification of the party responsible for quality control of signs,
B. Basis of acceptance for incoming raw materials at the fabrication facility,
C. Type, method and frequency of quality control testing at the fabrication facility,
D. List (by manufacturer and product name) of process colors, protective overlay film, retroreflective sheeting and black non-reflective film,
E. Recommended cleaning procedure for each product, and
F. Method of packaging, transport and storage for signs.

No legend shall be installed at the project site. Legend shall include letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters. The style, font, size, and spacing of the legend shall conform to the Standard Alphabets published in the FHWA Standard Highway Signs Book. The legend shall be oriented in the same direction in accordance with the manufacturer's orientation marks found on the retroreflective sheeting.

On multiple panel signs, legend shall be placed across joints without affecting the size, shape, spacing, and appearance of the legend. Background and legend shall be wrapped around interior edges of formed panel signs as shown on plans to prevent delamination.

The following notation shall be placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post or frame:

A. PROPERTY OF STATE OF CALIFORNIA,
B. Name of the sign manufacturer,
C. Month and year of fabrication,
D. Type of retroreflective sheeting, and
E. Manufacturer's identification and lot number of retroreflective sheeting.

The above notation shall be applied directly to the aluminum sign panels in 1/4-inch upper case letters and numerals by die-stamp and applied by similar method to the fiberglass reinforced plastic signs. Painting, screening, or engraving the notation will not be allowed. The notation shall be applied without damaging the finish of the sign.

Signs with a protective overlay film shall be marked with a dot of 3/8 inch in diameter. The dot placed on white border shall be black, while the dot placed on black border shall be white. The dot shall be placed on the lower border of the sign before application of the protective overlay film and shall not be placed over the legend and bolt holes. The application method and exact location of the dot shall be determined by the manufacturer of the signs.

For sign panels that have a minor dimension of 48 inches or less, no splice will be allowed in the retroreflective sheet except for the splice produced during the manufacturing of the retroreflective sheeting. For sign panels that have a minor dimension greater than 48 inches, only one horizontal splice will be allowed in the retroreflective sheeting.

Unless specified by the manufacturer of the retroreflective sheeting, splices in retroreflective sheeting shall overlap by a minimum of one inch. Splices shall not be placed within 2 inches from edges of the panels. Except at the horizontal borders, the splices shall overlap in the direction from top to bottom of the sign to prevent moisture penetration. The retroreflective sheeting at the overlap shall not exhibit a color difference under the incident and reflected light.

Signs exhibiting a significant color difference between daytime and nighttime shall be replaced immediately.

Repairing sign panels will not be allowed except when approved by the Engineer.

The Department will inspect signs at the Contractor's facility and delivery location, and in accordance with Section 6, "Control of Materials," of the Standard Specifications. The Engineer will inspect signs for damage and defects before and after installation.

Regardless of kind, size, type, or whether delivered by the Contractor or by a common carrier, signs shall be protected by thorough wrapping, tarping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Signs shall be dry during transit and shipped on palettes, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs.

Signs shall be stored in dry environment at all times. Signs shall not rest directly on the ground or become wet during storage. Signs, whether stored indoor or outdoor, shall be free standing. In areas of high heat and humidity signs shall be stored in enclosed climate-controlled trailers or containers. Signs shall be stored indoor if duration of the storage will exceed 30 days.

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the Engineer test samples of signs and materials used at various stages of production. Sign samples shall be 12" x 12" in size with applied background, letter or numeral, and border strip.

The Contractor shall assume the costs and responsibilities resulting from the use of patented materials, equipment, devices, and processes for the Contractor's work.

SHEET ALUMINUM

Alloy and temper designations for sheet aluminum shall be in accordance with ASTM Designation: B 209.

The Contractor shall furnish the Engineer a Certificate of Compliance in conformance with Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B 449. Surface of the sheet aluminum shall be cleaned, deoxidized, and coated with a light and tightly adherent chromate conversion coating free of powdery residue. The conversion coating shall be Class 2 with a weight between 10 milligrams per square foot and 35 milligrams per square foot, and an average weight of 25 milligrams per square foot. Following the cleaning and coating process, the sheet aluminum shall be protected from exposure to grease, oils, dust, and contaminants.

Sheet aluminum shall be free of buckles, warps, dents, cockles, burrs, and defects resulting from fabrication.

Base plate for standard route marker shall be die cut.

PROCESS COLOR AND FILM

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D 4956 are in dispute, the Engineer's visual test will govern.

The Contractor shall provide patterns, layouts, and set-ups necessary for the screened process.

The Contractor may use green, red, blue, and brown reverse-screened process colors for background and non-reflective opaque black film or black screened process color for legend. The coefficient of retroreflection for reverse-screened process colors on white retroreflective sheeting shall not be less than 70 percent of the coefficient of retroreflection specified in ASTM Designation: D 4956.

The screened process colors and non-reflective opaque black film shall have the same outdoor weatherability as that of the retroreflective sheeting.

After curing, screened process colors shall withstand removal when tested by applying 3M Company Scotch Brand Cellophane Tape No. 600 or equivalent tape over the color and removing with one quick motion at 90° angle.

SINGLE SHEET ALUMINUM SIGN

Single sheet aluminum signs shall be fabricated and furnished with or without frame. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions. Single sheet aluminum signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38.

Single sheet aluminum signs shall not have a vertical splice in the sheet aluminum. For signs with depth greater than 48 inches, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum signs shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of ±1/8 inch. The face sheet shall be affixed to the frame with rivets of 3/16-inch diameter. Rivets shall be placed within the web of channels and shall not be placed less than 1/2 inch from edges of the sign panels. Rivets shall be made of aluminum alloy 5052 and shall be anodized or treated with conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

Finished signs shall be flat within a tolerance of ±1/32 inch per linear foot when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within ±1/8 inch of the detailed dimensions.

Aluminum channels or rectangular aluminum tubings shall be welded together with the inert gas shielded-arc welding process using E4043 aluminum electrode filler wires as shown on the plans. Width of the filler shall be equal to wall thickness of smallest welded channel or tubing.

LAMINATED PANEL SIGN

Laminated panel signs shall consist of two sheet aluminum laminated to a honeycomb core and extruded aluminum frame to produce flat and rigid panels of one-inch or 2-1/2-inch nominal thickness.

The face of laminated panel signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H32 of 0.063-inch thickness. The back of laminated panel signs shall be fabricated from sheet aluminum alloy 3003-H14 of 0.040-inch thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The core material shall be phenolic impregnated kraft paper honeycomb and fungus resistant in accordance to Military Specification MIL-D-5272. The honeycomb cell size shall be 1/2 inch. Weight of the kraft paper shall be 80 pounds and impregnated minimum 18 percent by weight.

A laminating adhesive that can produce a resilient oil and water-resistant bond shall be used to adhere the extruded aluminum frame and the honeycomb core to the sheet aluminum. Edge and interior delamination occur when a 0.010-inch thick feeler gauge of 1/2 inch in length can be inserted into a depth of more than 1/2 inch between the extruded aluminum frame and the sheet aluminum. Laminated panel sign with delamination will be rejected.

Laminated panels shall be able to resist a wind load of 33 pounds per square foot for the following simple span lengths with a bending safety factor of 1.25:

Panel Type	Nominal Panel Thickness	Simple Span Length
A	one inch	9 feet 0 inch
B	one inch	9 feet 0 inch
	2-1/2 inch	14 feet 6 inches
H	2-1/2 inch	14 feet 6 inches

The tensile strength of laminated panels shall be at least 20 pounds per square inch when tested in accordance with the following modification and with ASTM Designations: C 297 and C 481, Cycle B after aging. Instead of spraying with hot water, the specimen shall be totally immersed in 158° F hot water. When requested by the Engineer or the Transportation Laboratory, at least one test sample of 12" x 12" in size shall be taken for every 2,000 square feet of the panel production cycle or of the total factory production order, whichever occurs first.

Rivets used to secure the sheet aluminum to the perimeter frame shall be fabricated from aluminum alloy 5052 and anodized or treated with a conversion coating to prevent corrosion. Size of the aluminum rivets shall be 3/16 inch in diameter and placed at the corners of the laminated panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed. Rivets or stainless steel screws shall be placed in holes drilled during fabrication in the perimeter frame.

On laminated multiple panel signs, a closure H-Section shall be placed in the top channel of the bottom panel. Perimeter frame of adjoining panel shall accommodate the closure H-Section in the closed position.

For signs with a depth of 5 feet 0 inch or less, the laminated panels shall be fabricated with no horizontal joints, splices or seams. For signs with a depth of greater than 5 feet 0 inch, the laminated panels may be fabricated in two panels.

The face of laminated panels shall be flat with a tolerance of ±3/32 inch per linear foot when measured across the plane of each panel in all directions. Where laminated panels adjoin, the gap between adjoining edges from one corner to the other corner shall not deviate by more than 1/32 inch. Non-adjoining edges from one corner to the other corner shall not deviate by more than 1/8 inch from a straight plane. The front and back sheet aluminum shall be flush with the perimeter frame. The panel edges shall be smooth.

Laminated panel signs shall be within +1/8 inch or -1/2 inch of the detailed dimensions. The difference in length between adjoining panels of multiple panel signs shall not be greater than 1/2 inch.

Roadside laminated panel signs shall be Type B. Type B panels shall have a nominal thickness of one inch or 2-1/2 inches.

The perimeter frame of Type B panels shall consist of extruded channel edges. The interior and exterior sides of the channels, except the sides touching the face and back sheet aluminum, shall be welded at the joint. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration.

Each side of the vertical tube spacers of Type B panels shall be welded to the perimeter frame, except the sides touching the front and back sheet aluminum.

The Contractor shall furnish mounting hardware for roadside laminated panel signs, such as closure H-sections, lags, bolts, nuts, and washers.

FORMED PANEL SIGN

Formed panel signs shall be fabricated from one continuous sheet aluminum alloy 5052-H32 of 0.063-inch thickness. The Contractor shall furnish sheet aluminum as provided in "Sheet Aluminum" of these special provisions.

The aluminum frame shall be affixed to the panel with aluminum rivets through the face of the sign panels. Color of the exposed portion of the rivets shall be the same color as the sign background or legend on which the rivets are placed.

The face of finished formed panel sign shall be flat with a tolerance of 1/8 inch per linear foot when measured across the plane of each panel in all directions.

The Contractor shall furnish mounting hardware for overhead formed panel signs. Hardware for the overhead formed panel signs shall include bolts, nuts, and washers.

The length and depth of the overhead formed panel signs shall be within ±1/16 inch of the detailed dimension.

The formed edges of the overhead panel signs shall be square. The mounting holes shall be straight and perpendicular to the front and back surfaces of the formed edges at the spacing shown on the plans. Holes that are improperly spaced and placed at the wrong angle will be rejected.

MEASUREMENT AND PAYMENT

Furnishing signs (except for construction area signs) will be measured by the square foot and the quantity to be paid for will be the total area, in square feet, of the sign panel types installed in place.

The contract price paid per square foot for furnish sign of the types specified in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fabricating and furnishing the signs, and fastening hardware, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for furnishing and installing protective overlay on signs shall be considered as included in the contract price paid per square foot for furnish sign of the various types and no separate payment will be made therefor.

10-1.58 REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

GENERAL

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D. Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 4 feet or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

MATERIALS

The concrete for reinforced concrete pipe shall contain not less than 470 pounds of cementitious material per cubic yard and have a water–cementitious material ratio that does not exceed 0.40 by weight. Supplementary cementitious material is optional. Reinforcement shall have a minimum cover of 1 inch.

Special reinforced concrete pipe, having concrete cover over the steel reinforcement greater than the cover specified in AASHTO Designation: M 170, shall conform to the provisions in Section 65-1.02, "Materials," and Section 65-1.02A, "Circular Reinforced Concrete Pipe," of the Standard Specifications, except the width of crack produced by the D-load test specified in AASHTO Designation: M 170 shall be the width determined by the following formula:

$$b = \frac{t - 3/8d}{t - 3/8d - C} \times 0.01 \text{ inch}$$

Where:

b = Width of crack to be produced in lieu of the 0.01-inch crack specified in AASHTO Designation: M 170

t = Wall thickness of pipe, inches

d = Effective depth of the section to be tested, feet

C = Concrete cover over steel reinforcement in excess of cover specified in AASHTO Designation: M 170

Reinforced concrete pipe that is to be hydrostatically tested shall be strength tested by the 3-edge bearing method to a maximum D-load of 10 percent greater than the 0.01-inch cracking D-load specified in AASHTO Designation: M 170 or to the actual D-load required to produce a 0.01-inch crack, whichever is the lesser.

Special oval shaped reinforced concrete pipe, having concrete cover over the steel reinforcement greater than the cover specified in AASHTO Designation: M 207, shall conform to the provisions in Section 65-1.02, "Materials," and Section 65-1.02B, "Oval Shaped Reinforced Concrete Pipe," of the Standard Specifications, except the width of crack produced by the D-load test specified in AASHTO Designation: M 207 shall be the width determined by the following formula:

$$b = \frac{t - 3/8d}{t - 3/8d - C} \times 0.01 \text{ inch}$$

Where:

b = Width of crack to be produced in lieu of the 0.01-inch crack specified in AASHTO Designation: M 207

t = Wall thickness of pipe, inches

d = Effective depth of the section to be tested, feet

C = Concrete cover over steel reinforcement in excess of cover specified in AASHTO Designation: M 207

Oval shaped reinforced concrete pipe that is to be hydrostatically tested shall be strength tested by the 3-edge bearing method to a maximum D-load of 10 percent greater than the 0.01 inch cracking D-load specified in AASHTO Designation: M 207 or to the actual D-load required to produce a 0.01-inch crack, whichever is the lesser.

MEASUREMENT AND PAYMENT

The Department does not pay any additional cost for use of optional supplementary cementitious material.

The Department does not pay any additional cost for excess concrete cover over steel reinforcement.

10-1.59 MISCELLANEOUS FACILITIES

Concrete flared sections shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

10-1.60 GRATED LINE DRAIN

This work shall consist of furnishing and installing precast grated line drain, with necessary fittings, coupling systems, frames, grates and associated items as shown on the plans and in conformance with these special provisions.

The interior surface of the grated line drain, below the level of the frame and grate and associated connections, shall be smooth. Grated line drain channel sections shall be manufactured of monolithic polymer concrete with no side extensions.

Monolithic polymer concrete shall be made from a composition of aggregate and polyester resin or vinylester resin and shall have the following properties when tested as follows:

PROPERTY	ASTM TEST METHOD	VALUE
Tensile Strength, psi	C 307	1,450 min.
Compressive Strength, psi	C 579	11,600 min.
Bending Strength, psi	C 580	2,900 min.
Moisture Absorption, %	C 140	0.5 max.
Chemical Resistance	C 267	Pass
Freeze/Thaw, number of cycles w/o weight loss	C 666	1,600 min.

The manufacturer of the grated line drain shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Grated line drain frames and grates shall be manufactured of ductile iron conforming to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications. The frames and grates need not be galvanized or coated with asphalt paint. Bolts, nuts, frame anchors, and other connecting hardware shall conform to the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications.

Frames and grates, when installed in conformance with the manufacturer's recommendations and these special provisions, shall be classified as heavy duty 25,000 proof load when tested in accordance with Commercial Item Description A-A-60005 for "Frames, Covers, Gratings, Steps, Manhole, Sump and Catch Basin." Frames and grates shall be matchmarked in pairs before delivery to the work and grates shall fit into the frames without rocking.

Frames shall be secured to the surrounding concrete backfill with steel anchoring rods as shown on the plans. Other methods may be used to secure the frame to the concrete backfill or grated line drain wall provided that a minimum pullout resistance of 685 pounds per foot of length of grated line drain frame is maintained.

Grates and frames shall be one piece unless shown on the plans to be removable. Removable grates shall be held in place by locking devices that are tamper resistant. Locking devices shall not constrict the waterway area of the grated line drain and shall be fully replaceable. Removable grates shall provide a minimum repetitive pullout resistance of 340 pounds per foot of length after completion of 1,000 hours of salt spray testing in conformance with the requirements in ASTM Designation: B 117. When a combination of one piece frame and grate and removable grates are used, the locations of the removable grates shall be as shown on the plans.

Except for grates installed within designated pedestrian paths of travel, grates shall accept inflow of runoff through openings. The openings shall consist of a minimum of 60 percent of the total top surface area of the grate, with individual openings or slots having a dimension not greater than 2 inches measured in the direction of the grated line drain flow line. Grates installed within designated pedestrian paths of travel shall be certified as conforming to the requirements of the "Americans with Disabilities Act."

Grated line drains shall be installed in trenches excavated to the lines and grades established by the Engineer. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the grated line drain.

Grated line drains shall be installed and jointed in conformance with the manufacturer's recommendations.

Grated line drains shall be installed to the lines and grades with sections closely jointed and secured to ensure that no separation of the line drains occurs during backfilling.

The frame or grate of the grated line drain shall not extend above the level of the surrounding concrete backfill.

Grated line drains shall be connected to new or existing drainage facilities as shown on the plans.

Excavation and backfill shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications.

Backfill for the grated line drains shall be either minor concrete or Class 3 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications. Minor concrete shall contain not less than 506 pounds of cementitious material per cubic yard.

Concrete backfill shall be placed in the trench as shown on the plans. Concrete backfill shall be placed against undisturbed material at the sides and bottom of the trench and in a manner that will prevent floating or shifting of the grated line drain and voids in, or segregation of, the concrete. Foreign material which falls into the trench, before or during placement of the concrete, shall be immediately removed. Where necessary, earth plugs shall be constructed and compacted at the ends of the planned concrete backfill to contain the concrete within the trench.

Concrete backfill shall be finished flush with the adjacent surfacing.

The surface of the concrete shall be textured with a broom or burlap drag to produce a durable skid-resistant surface.

The length the grated line drain to be paid for will be the length measured by the linear foot along the pavement surface as designated by the Engineer. No payment will be made for grated line drain placed in excess of the designated length.

The contract price paid per linear foot for grated line drain shall include full compensation for furnishing all labor, materials (including frames and grates), tools, equipment, and incidentals, and for doing all the work involved in installing grated line drains, complete in place, including excavation and backfill, connecting grated line drains to new or existing facilities, concrete collars, reinforcement, and other connecting devices, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.61 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications.

Rock slope protection fabric must be Class 8.

10-1.62 MISCELLANEOUS CONCRETE CONSTRUCTION

Curb and sidewalk shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

10-1.63 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

10-1.64 WATER WELL

GENERAL

Summary

This work shall consist of drilling, reaming, completing, developing and testing domestic water well and fire protection water well, in accordance with the details shown on the plans and these special provisions.

Regulations

The work shall be performed in accordance with all applicable portions of the: California Code of Regulations (CCR): Title 22, Title 24; California Plumbing Code, County laws, ordinances, and regulations. In the event of any conflict with the provisions herein, the applicable laws, ordinances, or regulations shall prevail. The work for the fire protection water well shall be performed in accordance with the requirements of the State Fire Marshall, the latest edition of the National Fire Protection Association (NFPA) Standard No. 20, "Installation of Stationary Pumps for Fire Protection," and the requirements of other regulatory authorities having jurisdiction. Attention is directed to the provisions of water well construction and sealing as set forth in the current issue of the Department of Water Resources Bulletin No.74, "Water Well Standards: State of California".

Equipment and Personnel

All necessary materials, equipment, labor, transportation, machinery, tools, fuel, water, power, light, sanitary facilities, and all other items incidental to the completion of the work shall be provided by the Contractor. All drilling and reaming shall be accomplished with either mud rotary, air rotary, sonic or mudless reverse rotary method.

Order of Work

The order of work shall proceed with accepted water well drilling practices, and in general consists of the following sequence of operations:

1. Drill and sample pilot hole.
2. Run geophysical logs.
3. Ream well to final diameter.
4. Caliper log reamed hole.
5. Set casing and complete well.
6. Develop and test well.
7. Steady-discharge pump test.
8. Disinfect well and perform television survey.

Once work has started on the pilot hole, the work shall be continued without delay to the completion of development, testing and disinfection unless otherwise permitted by the Engineer.

Submittals

Material lists, descriptive data, samples and other submittals specified in these special provisions shall be submitted for approval.

Submittals shall include, but not be limited to, the following:

1. One copy of the mechanical analysis results from the drill cutting samples.
2. One copy of the log of the pilot hole after completion of drilling of the pilot hole.
3. One copy of the "Water Well Driller's Report" with an attachment of one copy of the geophysical log.
4. One field copy of the completed geophysical log upon completion of logging.
5. Manufacturer's information for the blank well casing and well screen.
6. One copy of the filter material gradation analysis.
7. One copy of the results of the water level measurements taken during each of the steady-discharge pump tests.
8. One copy of the television survey recorded on a standard DVD.

Submittals shall be delivered to the locations indicated in these special provisions. If a specific location is not indicated, the submittal shall be delivered to the Office of Structures Design, Documents Unit, Second Floor, 1801 30th Street, Sacramento, California 95816, or mailed to the Office of Structures Design, Documents Unit, P.O. Box 942874, Sacramento, California 94274-0001.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall be not larger than 24" x 36".

Temporary Shutdown

Whenever the well site is left unattended for any reason, the bore hole shall be maintained as required to maintain bore hole integrity and shall be covered in a manner satisfactory to the Engineer.

Water Supply

An adequate supply of water for drilling and for developing and testing the well shall be provided in such a manner that a shortage of water will not be a cause for delay in the work.

MOBILIZATION, DEMOBILIZATION, AND FINAL CLEANUP

The Contractor shall move onto and set up all equipment and machinery at the designated well site. Upon completion of the work, all tools, equipment, machinery, and excess materials shall be removed from the premises. All cuttings, drilling fluid, and rubbish resulting from the work shall be disposed of in a manner approved by the Engineer. All sumps and excavations shall be filled and all ground surfaces disturbed by the well drilling and construction operations shall be restored to as near their original condition as possible, including the repair or replacement, at the Contractor's expense, of any damaged facility.

DRILL PILOT HOLE

Pilot Hole (Domestic Water Wells and Fire Protection Water Wells)

A pilot hole, of 12-inch minimum diameter shall be drilled to a depth as shown on plans.

Drilling Fluid

Drilling fluid shall be water except as otherwise provided herein. The fluid level in the pilot hole shall be kept at the ground surface at all times. Should lost circulation or other drilling problems require the addition of small amounts of bentonite, organic-base material, or other material, such material may be added with the approval of the Engineer. Prior to the addition of such material, the Contractor shall submit complete information sheets describing the composition of the materials to be added, including but not limited to Material Safety and Data Sheets (MSDS). The Contractor shall also submit to the Engineer for approval a procedure that will insure the removal of these additives during well development. Toxic or dangerous substances shall not be added to the drilling fluid.

Drill Cutting Samples

One pint of drill cutting samples shall be collected at least once every 5 feet from a depth of approximately 5 feet to the bottom of the pilot hole, or as directed by the Engineer. Samples shall be placed in one pint, clean, water-tight rigid containers, securely closed and sealed to avoid spillage and contamination, and clearly marked with the depth interval represented by the sample. Samples shall be made available for inspection by the Engineer at all times. The Contractor shall select samples, subject to the review of the Engineer, and shall have them analyzed by a

State certified soils laboratory. The results of the mechanical analyses, which shall include a gradation curve for each sample analyzed, shall be used by the Contractor to determine the size of the screen openings and the gradation of the filter material. Screen opening selection and filter material gradation shall be reviewed by the Engineer. Such review shall not relieve the Contractor of his responsibility for successful completion of the work. One copy of the mechanical analysis results shall be delivered to the Engineer.

Well Log

During the drilling of the pilot hole, the Contractor shall prepare and shall keep a complete log of the hole, setting forth the following:

1. The reference point of all measurements.
2. The depth at which each change in stratigraphy occurs.
3. The identification of the material of each stratigraphic level (clay, sand, gravel, etc.) and its physical condition (caving, running, squeezing, etc.)
4. The depth of any substantial loss of drilling fluid to the formation and the remedial measures taken.

The log of the pilot hole shall be made available for inspection by the Engineer at all times. One copy of the log of the pilot hole shall be delivered to the Engineer immediately after completion of drilling of the pilot hole.

Within 30 days after completion of the water well, the Contractor shall submit a complete and accurate "Water Well Driller's Report" to the Department of Water Resources in accordance with the provisions of Section 13750 through 13755 of the California Water Code. A final copy of the geophysical log shall be attached to the "Water Well Driller's Report". A copy of the "Water Well Driller's Report" with one final copy of the geophysical log shall be submitted to the Engineer at the time of filing with the Department of Water Resources.

Geophysical Logging

After the pilot hole has reached its final depth, a geophysical log shall be made of the entire hole. The pilot hole shall be clear of obstructions prior to running the log. Logging shall commence at the bottom of the pilot hole and shall end approximately at the ground surface. The pilot hole shall be kept full of drilling fluid during logging. After the pilot hole has been reamed it shall be caliper logged.

The geophysical log shall consist of the following:

1. Spontaneous potential curve
2. Point resistivity curve
3. 6-foot lateral resistivity curve
4. Caliper log

The logging scale shall be subject to approval by the Engineer. The completed geophysical log shall show the mud resistivity (showing temperature) and the mud filtrate resistivity (showing temperature) of the drilling fluid. One field copy of the completed geophysical log shall be delivered to the Engineer immediately on completion of logging.

COMPLETION OF WATER WELL

Reaming Water Well

After geophysical logging has been completed, except for caliper logging, the upper portion of the pilot hole shall be reamed to the diameter and depth of the well seal as shown on the plans. After the conductor casing has been placed and sealed, the remainder of the pilot hole shall be reamed to the bore diameter shown on the plans. Following the reaming of the pilot hole, the hole shall be caliper logged.

After reaming and caliper logging has been completed, the well shall be cased and developed.

Conductor Casing

The domestic and fire protection water well shall be equipped with a conductor casing. The casing shall have an outside diameter as shown on the plans and a wall thickness of .375 inch. It is estimated that the conductor casing setting will be at a depth of 50 feet for the Domestic Water Well and 250 feet for Fire Protection Water Well; however, the Engineer may order the setting to a greater depth depending on subsurface conditions. The conductor casing shall extend above the ground surface a sufficient distance so that no surface water can drain into the well. An 4-inch Schedule 40 filter feed pipe shall be welded to the top of the conductor casing in such a manner that filter material can be added to the well at any time in the future. The filter feed pipe shall be inclined as shown on the plans and shall be equipped with a screw cap.

The conductor casing material shall be new and shall conform to the requirements of AWWA C200, single ply, steel pipe with welded or threaded ends and couplings.

The conductor casing shall be equipped with welding collars or threaded ends and couplings. All field joints shall be welded and shall be watertight. All welds shall be made using welding rod appropriate for the type of metal to be welded.

Welding collars shall be of the same thickness and shall have the same chemical and physical properties as the corresponding casing section, shall be a minimum of 5 inches in width, shall be rolled to fit the diameter, and shall be welded to the casing section. The inside edge of the collars shall be ground or sufficiently scarfed to remove sharp edges or burrs. Section ends shall be machined flat perpendicular to the axis of the casing and shall not vary more than 0.010 inch at any point from a true plane at right angles to the casing. Three round alignment holes shall be provided in each collar to insure proper matching of the sections.

Well Seal

After the conductor casing has been landed, a well seal shall be placed between the wall of the reamed bore and the conductor casing. The seal shall be composed of a slurry of neat cement and water. The neat cement mixture shall be composed of one bag (94 pounds) of portland cement to not more than 6 gallons of clean water. Bentonite may be used up to total of 3 percent of the volume of cement. The sealing material shall be placed in one continuous pour by use of a pressure grout pump from the bottom of the interval to be sealed to the ground surface. Upon completion of the placement of the sealing material, the slurry shall be visible above the ground surface at all points around the circumference of the conductor casing. After cementing operations are complete, the seal shall be left undisturbed for a period of not less than 48 hours.

Blank Well Casing - Domestic Water Well

Blank well casing material shall conform to the requirements of ASTM Designation: A 139~~,~~ or A53, Grade. The blank well casing shall be manufactured in the same manner as the conductor casing and shall be equipped with welding collars or threaded ends and couplings in the same manner as the conductor casing. All field joints shall be welded and shall be watertight. All welds shall be made using welding rod appropriate for the type of metal to be welded. Blank well casing shall have an outside diameter as shown on the plans and a wall thickness of 0.25 inch. The blank well casing shall extend from the ground surface to the top of the well screen and from the well screen to the bottom of the well. The blank well casing diameter in the Fire Protection Water Well shall not be less than 2 inches larger than the pump bowls. The bottom end of the blank casing shall be capped or plugged in a manner approved by the Engineer. One 2-inch diameter Schedule 40 sounding pipe shall be welded to the blank casing and inclined as shown on the plans. The sounding pipe shall be equipped with a vented screw cap.

Centralizers shall be placed 5 feet above and 5 feet below any section of well screen and at to assure plumbness and alignment of the blank casing and well screen. Wherever possible, centralizers shall be placed in clay formation.

Domestic Water Well Screen

The well screen shall be a total of 100 feet in length and shall be manufactured from Type 304 stainless steel. The openings in the well screen shall be machine-made, perpendicular to the axis of the casing and of a louver form with the aperture facing downward. The well screen shall have the same outside diameter as the blank well casing and a wall thickness of 0.25 inch. Appropriate welding rings or couplings shall be provided for the connection between the blank well casing sections and the stainless steel well screen sections. The well screen shall be welded to the blank well casing using an appropriate type of welding rod for the 2 types of metal to be welded.

Fire Protection Water Well Screen

The well screen shall be a total of 80 feet in length (minimum) and shall be manufactured from Type 304 stainless steel. The entrance velocity shall not exceed 0.15 feet/second. The openings in the well screen shall be machine-made, perpendicular to the axis of the casing and of a louver form with the aperture facing downward. The well screen shall have the same outside diameter as the blank well casing and a wall thickness of 0.375 inch. Appropriate welding rings or couplings shall be provided for the connection between the blank well casing sections and the stainless steel well screen sections. The well screen shall be welded to the blank well casing using an appropriate type of welding rod for the 2 types of metal to be welded.

Setting Domestic Water Well Screen

The final determination of the depth settings and lengths of well screen to be installed shall be made by the Contractor subject to the review and approval of the Engineer after examination of the geophysical logs, except that any length of well screen totaling in excess of the length specified under "Well Screen" in these special provisions

shall be approved by the Engineer. The size of the screen openings to be used on the screen shall be selected by the Contractor, subject to the review and approval of the Engineer based on the character and sieve analysis of the aquifer samples, the type of grading of gravel selected for the filter material and allowing for maximum entrance velocity of 0.10 foot per second at a design pumping rate of 100 gallons per minute.

Setting Fire Protection Water Well Screen

The final determination of the depth settings and lengths of well screen to be installed shall be made by the Contractor subject to the review and approval of the Engineer after examination of the geophysical logs, except that any length of well screen totaling in excess of the length specified under "Well Screen" in these special provisions shall be approved by the Engineer. The size of the screen openings to be used on the screen shall be selected by the Contractor, subject to the review and approval of the Engineer based on the character and sieve analysis of the aquifer samples, the type of grading of gravel selected for the filter material and allowing for maximum entrance velocity of 0.15 feet/second at a design pumping rate of 450 gallons per minute.

Filter Material

Filter material shall be composed of thoroughly washed, sound, durable, well-rounded particles, containing no silt, clay, organic matter, or deleterious materials. The gradation of the filter material shall be determined by the Contractor subject to the review of the Engineer based on the mechanical analyses of the drill cuttings samples. The size of the filter material shall be matched to the grain size of the water-bearing stratum. The gradation of the filter material, as determined by a State certified testing laboratory, shall be submitted to the Engineer prior to delivery of the filter material to the well site. Filter material may be delivered in bags, and stacked at the well site or it may be delivered in bulk. If delivered in bulk, it shall be placed on a protective sheet.

Installation of Blank Casing and Well Screen

Sections of blank casing and well screen, herein called the casing string, complete with appropriate centralizers and closed bottom, shall be lowered into the well. In no instance shall it be driven, forced, or allowed to rest on the bottom of the hole. It shall remain suspended from the surface until the filter material has been added to the well.

Installation of Filter Material

After the centralized casing string has been suspended in the hole, the placement of the filter material shall proceed without delay. The filter shall be placed by a tremie pipe lowered to the bottom of the annular space between the outside of the casing and the wall of the hole. As filter material is poured into the tremie pipe, water shall also be introduced to help carry the filter material. The tremie pipe shall be slowly raised as the filter material fills the annular space. After the pouring of the filter material has commenced, a solution of polyphosphate shall be added to the circulation water. The total amount of polyphosphate added shall be in the amount of 5 pounds per 100 gallons of circulation water. Polyphosphates used shall be one of the following: tetra sodium polyphosphate, sodium tripolyphosphate, sodium hexameta phosphate or sodium septaphosphate. The annular space shall be filled from the bottom of the hole back to the ground surface. A watertight cover shall be installed between the conductor casing and the well casing.

The volume of filter material introduced into the well shall be not less than the computed volume of the annular space between the outside of the casing string and the wall of the hole. If the amount of filter material introduced is less than the computed amount, it is an indication of bridging and the Contractor shall perform appropriate corrective measures at no additional cost to the State. The Contractor shall provide a means for the accurate measurement of the volume of filter material added to the well. The surface level of the filter envelope shall be maintained at all times by adding filter material as needed.

Plumbness and Alignment

After the casing is installed, alignment and plumbness shall be tested by the Contractor, in the presence of the Engineer, by lowering a minimum 40-foot long section of pipe, or a dummy of the same length, into the well for the full depth of the casing. The difference between the inside diameter of the casing and the outside diameter of the dummy or pipe shall not exceed one inch.

If a dummy is used, it shall consist of a rigid spindle with rings. Each ring shall be at least 12 inches wide. The rings shall be truly cylindrical and shall be spaced one at each end of the dummy and one ring in the center. The central member of the dummy shall be rigid, so that it will maintain the alignment of the axis of the rings.

Should the section of pipe or dummy fail to move freely throughout the length of casing in the well to the full depth, or should the well vary from the vertical in excess of two-thirds the inside diameter of the casing per 100 feet in the total depth of the well, the plumbness and alignment of the well shall be corrected by the Contractor at his expense.

WELL DEVELOPMENT

Within 48 hours after the filter pack operation is completed and the casing tested and accepted for alignment and plumbness, the well shall be thoroughly developed by mechanical and chemical methods including surging, backwashing, and pumping with the test pump equipment, to remove any mud cake from the wall of the reamed bore, remove any mud that may have penetrated the water-bearing formation and to stabilize the water-bearing materials and filter material. The methods and procedures used for development shall be at the option of the Contractor.

Development Tests

All necessary measuring instruments and pumping equipment needed to conduct the testing shall be furnished and installed and then removed upon completion of testing. Measuring instruments shall be capable of indicating the depth of water within 10 seconds of the required time of measurement and shall be accurate to within 0.10 foot. The test pumping equipment shall be capable of discharging not less than 140 gallons per minute at the pumping water level encountered in the domestic water well and not less than 675 gallons per minute at the pumping water level encountered in the fire protection water well. The pumping unit shall be complete with an ample power source, controls, and appurtenances and shall be capable of being operated without interruption for a period of at least 36 hours. The prime mover shall be equipped with a throttling device so that the discharge can be reduced to 25 gallons per minute for the domestic water well and 450 gallons per minute for the fire protection water well. The Contractor shall furnish, install, and remove a discharge pipe of sufficient size and length to conduct water from the pumping unit to a point designated by the Engineer.

Development of the well shall be continued until, in the Contractor's opinion, the well is fully developed. The Contractor shall notify the Engineer when the well is developed and ready for testing. Three steady-discharge pump tests shall be performed on the well by the Contractor in the presence of the Engineer. The tests for the domestic water well shall be of 3 hours duration each at the flow rates of 140, 100 and 25 gallons per minute and 8 hours duration each at the flow rates of 675 and 450 gallons per minute for the fire protection water well, respectively, during which time water level readings will be taken as specified under "Testing Well" in these special provisions. Each test shall start with the water elevation in the well at the static water level. During fire protection water well testing, the static water level of other wells within 1,000 feet shall be monitored.

Sand production shall be less than 5 parts per million within 15 minutes after commencement of pumping at a rate of 100 gallons per minute for the domestic water well and 675 gallons per minute for the fire protection water well. Development of the fire protection water well shall be performed with a test pump, not a fire pump. Sand production shall be measured by a centrifugal sand separator similar to that described in the Journal of the American Waterworks Association, Vol.46, No.2, February, 1954.

From the steady discharge pump tests of the well, the Engineer will determine the 3 hour specific capacity of the domestic water well in gallons per minute per foot of drawdown, 8 hour specific capacity of the fire protection water well in gallons per minute per foot of drawdown and the transmissivity of the water-bearing materials in gallons per day per foot. The specific capacity will be determined for a pumping rate of 100 gallons per minute for the domestic water well and 675 gallons per minute for the fire protection water well, or a drawdown which is approximately 10 feet above the top of the uppermost well screen after 3 hours of pumping for the domestic water well, whichever is achieved first. If the sand production exceeds 5 parts per million or if the Engineer determines that the three hour specific capacity of the domestic well, or 8 hour specific capacity of the fire protection water well at the selected pumping rate is not equal to or greater than 0.0004 times the transmissivity in gallons per day per foot, the Contractor shall resume development operations at his own expense, to reduce the sand production or to improve the well's specific capacity as required. If the Contractor is unable to construct and develop the well as specified herein to meet these requirements consistently, the well shall be abandoned as provided for under "Incompletion of Well" in these special provisions.

These tests during the development shall not be counted as part of the pumping tests specified under "Testing Well" in these special provisions.

Cleaning of Bottom of Well

After developing and before the development tests described above are made of the well, the well shall be sounded, and if any material is found inside the well within 5 feet of the bottom of the lowest screen, it shall be cleaned out of the well.

Water Sampling

After completion of all domestic waterwell testing, the Contractor shall obtain 4 one-half-gallon or larger samples of water from the well in chemically clean bottles (obtainable from a State certified laboratory). Water

samples shall be submitted to a State certified water testing laboratory for analysis within eight hours of sampling. Where necessary and as specified by the laboratory, 2 of the samples shall be chemically stabilized or kept under proper refrigeration to prevent precipitation or other alteration of the mineral constituents prior to analysis. Sample bottles shall be clearly marked with the method and degree of stabilization, if any. Sampling methods and sample preservation procedures shall be EPA approved methods. The results of the water analyses shall be furnished to the Engineer without delay.

The samples shall be analyzed for General Mineral, General Physical, Inorganic Chemicals, and radionuclides listed with drinking water standards as required by the Department of Public Health Services and in accordance with the California Code of Regulations, Title 22.

Disinfection

After all work on the domestic water wells and fire protection water wells have been completed, the well shall be thoroughly disinfected while the test pump is in place, in the following manner and in accordance with the California Code of Regulations, Title 22 for the disinfection of water wells:

1. The proper amount of chlorine solution shall be added to the well such that the concentration of chlorine in the well water shall be at least 50 parts per million available chlorine.
2. The pump shall be surged as necessary so as to thoroughly mix the chlorine solution with the water in the well. Water shall then be pumped to waste until the discharged water has a noticeable odor of chlorine.
3. The well shall then be allowed to stand undisturbed for at least 24 hours.
4. The water shall then be pumped to waste until there is no noticeable taste or odor of chlorine.
5. The Contractor shall sample the water pumped from the well. The sample shall be placed in a sterile container, available from laboratories, and sent to a State certified laboratory for bacterial analysis. If the laboratory analysis shows that the water pumped from the well is not free from all harmful bacteria, the disinfection procedure shall be repeated until a subsequent analysis is absent for bacteria.
6. A copy of the analysis shall be delivered to the Engineer.

Television Survey

After the well has been disinfected a television survey shall be made of the inside of the well from the ground surface to the bottom of the well and from the bottom of the well to the ground surface. The survey shall clearly show the interior of the blank casing and well screen through the means of a downward-looking camera having adequate illumination; the depth, in feet, of the camera shall be indicated at all times on the survey. The survey shall be recorded on a standard DVD, which shall be delivered to the Engineer on completion of the survey.

TESTING WELL

Within 48 hours after well development, the Contractor shall perform a steady-discharge pump test on the well.

The pumping tests for the domestic water well shall be made for a period of 24 hours at a pumping rate of 100 gallons per minute followed immediately by a 6-hour recovery test.

The pumping tests for the fire protection well shall be made for a period of 8 hours at a pumping rate of 675 gallons per minute followed immediately by a 6-hour recovery test.

During the pumping test, the discharge of the pump shall be measured with an accurate totalizing meter, a circular orifice meter, or a venturi meter approved by the Engineer. The pump discharge shall be maintained at all times during test within plus or minus 5 percent of the pumping rate by means of a valve. Prior to the start of the test, the pump shall be turned off and the static, or non-pumping level shall be determined. The static water level shall be considered to be attained when 3 successive water level measurements, spaced 20 minutes apart, show no appreciable rise in water level in the well.

The tests for the domestic water well shall be made according to the following schedule:

1. Turn pump on to approved test pumping rate at time (t)=0.
2. The Contractor shall measure and record depth to water as follows:

    a. Each minute, from t=1 to t=12
    b. Each 2 minutes, from t=14 to t=20
    c. Each 5 minutes from t=25 to t=50
    d. Each 10 minutes from t=60 to t=100
    e. At t=130, t=160, t=200, t=250, t=300 (5 hours)
    f. Each 100 minutes from t=400 to t=1,000
    g. At t=1,200, t=1,300, and t=1,440 (24 hours).

3. Turn pump off at t=1,440 (24 hours).
4. The Contractor shall measure depth to water and record as follows:

    a. Each minute, from t=1,440 to t=1,450
    b. Each 2 minutes, from t=1,452 to t=1,460
    c. Each 5 minutes, from t=1,465 to t=1,480
    d. Each 10 minutes, from t=1,490 to t=1,540
    e. At t=1,560, t=1,590, t=1,620, t=1,640, t=1,670, t=1,740, and t=1,800 (30 hours).

The depth to water tests for the fire protection water well shall be made for a period of at least 8 hours with 15 minute interval readings over the period of the test. After the pump has been turned off, the 6-hour recovery test shall begin and have 15 minute interval depth to water readings over the period of the test.

The tests for fire supply water well shall be made according to the following schedule:

1. Turn pump on to approved test pumping rate at time (t)=0.
2. The Contractor shall measure and record depth to water as follows:

    a. Each minute, from t=1 to t=12.
    b. Each 2 minutes, from t=14 to t=20.
    c. Each 5 minutes, from t=25 to t=50.
    d. Each 10 minutes, from t=60 to t=100.
    e. At t=130, t=160, t=200, t=250, t=300 (5 hours).
    f. Each 100 minutes from t=400 to t=480.

In the case of failure of the pump operation for a period greater than one percent of the elapsed pumping time from t=0 for the domestic water well and from pump start for the fire protection water well, the test shall be suspended until the static water level has been attained. Should the test be aborted as a result of a deficiency on the part of the Contractor's equipment or personnel, all time consumed in waiting for complete water level recovery and in resuming the pump test to the point where it was aborted or suspended shall be at no cost to the State.

After the pump test has been completed, the record of water level measurements shall be delivered to the Engineer. All sand, silt, and materials from inside the casing shall be removed and the annular space between the casing and the wall of the hole shall be refilled with filter material to replenish any settlement which may have occurred during development and testing operations.

INCOMPLETION OF WELL

In the event that the pilot hole or well cannot be completed as specified due to the Contractor's operations, the Contractor, at no expense to the State, shall abandon the pilot hole or water well in the following manner and in accordance with the provisions set forth for the destruction of water wells in the current issue of the Department of Water Resources Bulletin No.74:

1. The pilot hole or well shall be filled with native or other approved materials from the bottom of the well to a depth of 20 feet below ground surface.
2. If there is any casing remaining in the hole at the time of abandonment, an excavation shall be made around it to a depth of 5 feet below ground surface.
3. Any casing remaining in the hole shall be cut off at a depth of 5 feet and the upper portion thereof removed and disposed of.
4. The pilot hole or water well shall be filled with neat cement, cement grout, or concrete from a depth of 20 feet to a depth of 5 feet. If there is any casing remaining in the hole, the sealing material shall be allowed to spill over into the surrounding excavation to form a cap at least one foot thick.
5. After the upper sealing material has set, the remaining portion of the pilot hole or excavation shall be filled and graded with native materials.

After abandonment of the pilot hole or water well, the Contractor shall, at no expense to the State, move the drilling equipment a short distance and drill a new pilot hole or water well.

MEASUREMENT AND PAYMENT

No adjustment of compensation will be made for any increase, decrease, or elimination in the quantity of the items of work involved in drilling pilot holes, reaming water wells, conductor casings, blank well casings, well screens, and testing wells regardless of the reason for such increase, decrease, or elimination. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the items of work involved in drilling pilot holes, reaming water wells, conductor casings, blank well casings, well screens, and testing wells.

Mobilization, demobilization and final cleanup; and well development shall be measured and paid for at lump sum contract price.

The contract lump sum price paid for mobilization, demobilization and final cleanup shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in mobilization, demobilization and final cleanup, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract lump sum price paid for well development shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in well development, complete in place, including development tests, cleaning bottom of well, water sampling, disinfection, and television survey, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The length of drilling pilot holes and reaming water wells shall be the measured length from original ground surface to the bottom of the pilot hole or reamed well.

The contract price paid per linear foot for drilling pilot holes shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in drill pilot hole, complete in place, including drilling fluid, drill cutting samples, well log and geophysical logging, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per linear foot for reaming water wells shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in reaming water wells, complete in place, including filter material and installation of filter material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The length of conductor casing, blank well casing and well screen shall be the total measured length in-place in the completed work.

The contract price paid per linear foot for conductor casing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in conductor casing, complete in place, including well seal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per linear foot for blank well casing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in blank well casing, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per linear foot for well screen shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in well screen, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Testing well shall be measured and paid for by the hour. Testing well shall be the actual time required for the steady-discharge pump test and the 6-hour recovery test.

The contract price paid per hour for testing well shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in testing well, complete in place, as specified in these special provisions, and as directed by the Engineer.

10-1.65 FENCE (TYPE DESERT TORTOISE) (Type 1)

Fence (Type Desert Tortoise) (Type 1) shall be furnished, installed, and maintained as specified in these special provisions and as directed by the Engineer. The Engineer will mark the location of the fence to be installed as identified on the design plans.

Except as otherwise specified in this section, fence shall conform to the specification for Fence (Type Desert Tortoise) (Type 1).

Except as otherwise specified in this section, Fence (Type Desert Tortoise) (Type 1).shall conform to the Section 80 of the Standard Specifications.

MATERIALS

Used materials may be installed provided the used materials conform to these special provisions. Materials for Fence (Type Desert Tortoise) (Type 1) shall conform to the following:

Wire Mesh

The wire mesh shall have a mesh size of 1"X 2" inch fastened securely to posts. The wire mesh shall be extended at least a minimum of 20 inches above the ground and shall be placed below the ground as shown on plans. Wire mesh shall be commercial quality and shall be approved by the Engineer.

Wire mesh shall be galvanized16 gauge.

Miscellaneous

Tension wire, tie wire and hog ring wires shall be in conformance to the details as shown on the plans. Materials requirement for tension wire, tie wire and hog ring wires shall conform to the provisions in Section 80.4.01C, "Fences," of the Standard Specifications.

Posts

Posts for the Fence (Type Desert Tortoise) (Type 1) shall be metal posts. Metal posts shall conform to the provisions in Section 80-3.01A, "Metal Posts and Braces," of the Standard Specifications.

INSTALLATION

Fence (Type Desert Tortoise) (Type 1) shall be installed as follows:

A. Fence (Type Desert Tortoise) (Type 1) shall be constructed prior to any clearing and grubbing work.
B. Fence (Type Desert Tortoise) (Type 1) shall be located to be unobstructed from view, as determined by the Engineer.
C. Fence (Type Desert Tortoise) (Type 1) shall be erected in the presence of the Engineer.
D. Fence (Type Desert Tortoise) (Type 1) shall be continuous along the length of the fence. Gaps shall not be allowed unless where designated on design plans or under the direction of the Engineer.
E. Fence (Type Desert Tortoise) (Type 1) shall be buried to the minimum depth shown on plans. Backfill shall be compacted. by ponding or jetting in accordance with Section20-5.03D, "Trenching and Backfilling," of the Standard Specifications.

MAINTENANCE

Fence (Type Desert Tortoise) (Type 1) that is damaged during the progress of the work shall be repaired or replaced by the Contractor, at the Contractors expense, the same day the damage occurred. After every storm, Fence (Type Desert Tortoise) (Type 1) shall be inspected for any damage, within 12 hours after the storm.

MEASUREMENT AND PAYMENT

The contract price paid per linear foot for Fence (Type Desert Tortoise (Type 1) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in excavation, backfilling, compaction and constructing Fence (Type Desert Tortoise) (Type 1) complete in place, including maintenance, as specified in these special provisions, and as directed by the Engineer.

10-1.66 CHAIN LINK FENCE

Chain link fence shall be Type CL-6 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications.

10-1.67 MONUMENTS

Survey monuments shall be constructed in conformance with the provisions in Section 81, "Monuments," of the Standard Specifications and these special provisions.

Concrete shall be Class 3 or minor concrete at the option of the Contractor.

The cast steel and gray cast iron frames and covers, including hardware, shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

10-1.68 MARKERS AND DELINEATORS

Markers and delineators shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Markers and delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

10-1.69 METAL BEAM GUARD RAILING

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work" of these special provisions.

Line posts shall be wood, steel, or plastic. Blocks shall be wood or plastic.

ALTERNATIVE IN-LINE TERMINAL SYSTEM

Alternative in-line terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for an in-line terminal system shall consist of one of the following or a Department approved equal.

A. TERMINAL SYSTEM (TYPE SKT) - Terminal system (Type SKT) shall be a SKT 350 Sequential Kinking Terminal manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type SKT) 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. TERMINAL SYSTEM (TYPE ET) - Terminal system (Type ET) shall be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type ET) shown on the plans. The ET-2000 PLUS (4-tube system) extruder terminal can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, telephone (800) 772-7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall 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 terminal system (Type ET) the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which 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 terminal system (Type SKT) the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer shall be moistened and thoroughly compacted. Wood posts shall 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 shall be coated with a grease which 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.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for alternative in-line terminal system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative in-line terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.70 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Concrete for use in concrete barriers shall contain not less than 675 pounds of cementitious material per cubic yard and shall be air-entrained concrete in conformance with the provisions in "Materials" of these special provisions.

Bar reinforcing steel for use in concrete barriers shall conform to the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications.

Concrete barriers on bridges or walls shall be cured in conformance with the provisions in Section 90-7.01A, "Water Method," of the Standard Specifications.

Full compensation for epoxy-coated bar reinforcement shall be considered as included in the contract price paid per linear foot for concrete barrier of the type or types listed in the Engineer's Estimate and no separate payment will be made therefor.

Concrete barrier (Type 732A) will be measured and paid for as concrete barrier (Type 732).

Full compensation for roughening concrete surfaces, removing portions of existing concrete barriers, and drilling and bonding dowels shall be considered as included in the contract price paid per linear foot for concrete barrier (transition) and no separate payment will be made therefor.

10-1.71 TRANSITION RAILING (TYPE WB)

Transition railing (Type WB) shall be furnished and installed in conformance with details shown on the plans, the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The 10-gage rail elements shall conform to the requirements of Class B, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180. End caps shall conform to the requirements of Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

Surplus excavated material remaining after the transitional railing (Type WB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

The contract unit price paid for transition railing (Type WB) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing transition railing (Type WB), complete in place, including drilling holes for wood posts, driving posts, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.72 CRASH CUSHION (TYPE CAT)

Crash cushion (Type CAT) and crash cushion (Type CAT) backup shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Crash cushion (Type CAT) shall be a CAT-350 Crash Cushion Attenuating Terminal as manufactured by Trinity Industries, Inc., and shall include all the items detailed for crash cushion (Type CAT) shown on the plans.

Crash cushion (Type CAT) backup shall consist of items detailed for crash cushion (Type CAT) backup shown on the plans and shall conform to the provisions in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications.

Excluding the crash cushion (Type CAT) backup, arrangements have been made to ensure that any successful bidder can obtain the CAT-350 Crash Cushion Attenuating Terminal from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, telephone (800) 772-7976. The price quoted by the manufacturer for the CAT-350 Crash Cushion Attenuating Terminal, FOB Centerville, Utah is $4500, not including sales tax.

The above price will be firm for orders placed on or before December 1, 2013, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that crash cushion (Type CAT) conforms with the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

The crash cushion (Type CAT) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached, shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer shall be moistened and thoroughly compacted. Wood posts shall 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 shall be coated with a grease which 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.

Surplus excavated material remaining after the crash cushion (Type CAT) and backup have been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

Crash cushion (Type CAT) and crash cushion (Type CAT) backup will be measured as units determined from actual count in place in the completed work.

The contract unit prices paid for crash cushion (Type CAT) and for crash cushion (Type CAT) backup shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing crash cushion (Type CAT) and crash cushion (Type CAT) backup, complete in place, including excavation, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.73 THERMOPLASTIC PAVEMENT MARKING

Thermoplastic pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

For each batch of thermoplastic material for pavement markings, the Contractor shall submit to the Engineer:

1. Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications
2. Department's Materials Engineering and Testing Services notification letter stating that the material is approved for use
3. Material Safety Data Sheet

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Within 14 days of applying a thermoplastic pavement marking, the retroreflectivity of the pavement marking shall be a minimum of 250 millicandelas per square meter per lux for white, and 150 millicandelas per square meter per lux for yellow. The Contractor shall test the retroreflectivity under ASTM E 1710.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic pavement markings, the tape will be measured and paid for by the square foot as thermoplastic pavement marking.

10-1.74 THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE)

Sprayable thermoplastic traffic stripes (traffic lines) shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Sprayable thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification No. PTH-02SPRAY.

Within 14 days of applying a sprayable thermoplastic traffic stripe, the retroreflectivity of the traffic stripe shall be a minimum of 250 millicandelas per square meter per lux for white, and 150 millicandelas per square meter per lux for yellow. The Contractor shall test the retroreflectivity under ASTM E 1710.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the sprayable thermoplastic traffic stripes. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Sprayable thermoplastic material shall be applied to the pavement at a minimum thickness of 0.039-inch and a minimum rate of 0.13-lb/ft. The minimum application rate is based on a solid stripe of 4 inches in width.

Sprayable thermoplastic material shall be applied to the pavement at a temperature between 351° F and 401° F, unless a different temperature is recommended by the manufacturer.

Sprayable thermoplastic traffic stripes shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

If permanent tape is placed instead of sprayable thermoplastic traffic stripes, the tape will be measured and paid for by the linear foot as thermoplastic traffic stripe (sprayable).

Sprayable thermoplastic traffic stripes will be measured by the linear foot along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two 4-inch wide yellow stripes, will be measured as one traffic stripe.

The contract price paid per linear foot for thermoplastic traffic stripe (sprayable) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying sprayable thermoplastic traffic stripes (regardless of the number, widths, and patterns of individual stripes involved in each traffic stripe) including establishing alignment for stripes, and layout work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.75 PAINT PAVEMENT MARKING

Painted pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

For each batch of paint for pavement markings, the Contractor shall submit to the Engineer:

1. Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications
2. Department's Materials Engineering and Testing Services notification letter stating that the material is approved for use
3. Material Safety Data Sheet

Pavement marking paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the painted pavement markings shall conform to the requirements in ASTM Designation: D 6628-01.

Within 14 days of applying a painted pavement marking, the retroreflectivity of the pavement marking shall be a minimum of 250 millicandelas per square meter per lux for white, and 150 millicandelas per square meter per lux for yellow. The Contractor shall test the retroreflectivity under ASTM E 1710.

At the option of the Contractor, permanent pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of painted pavement markings. Permanent tape, if used, shall be placed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of painted pavement markings, the tape will be measured and paid for by the square foot as paint pavement marking of the number of coats designated in the Engineer's Estimate.

10-1.76 PARKING BUMPER

Parking bumpers shall be furnished and installed at the locations and in the manner shown on the plans.

Parking bumpers shall be precast with concrete and reinforcing steel as shown on the plans. Concrete shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. Concrete shall contain not less than 472 pounds of cementitious material per cubic yard. Parking bumpers may be commercially available precast concrete bumpers conforming to the details shown on the plans. Minor variations in cross section dimensions will be acceptable in commercially available units.

Dowels shall be commercial quality reinforcing steel or mild steel rods.

Parking bumpers will be measured by the unit as determined from actual count in place.

The contract unit price paid for parking bumper (precast concrete) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing precast concrete parking bumpers, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

10-1.77 PAVEMENT MARKERS

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Attention is directed to "Traffic Control System For Lane Closure" of these special provisions regarding the use of moving lane closures during placement of pavement markers with bituminous adhesive.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS

10-2.01 GENERAL

The work performed in connection with highway planting and irrigation systems shall conform to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

PROGRESS INSPECTIONS

Progress inspections will be performed by the Engineer for completed highway planting and irrigation system work at designated stages during the life of the contract.

Progress inspections will not relieve the Contractor of responsibility for installation in conformance with the special provisions, plans and Standard Specifications. Work within an area shall not progress beyond each stage until the inspection has been completed, corrective work has been performed, and the work is approved, unless otherwise permitted by the Engineer.

The requirements for progress inspections will not preclude additional inspections of work by the Engineer at other times during the life of the contract.

The Contractor shall notify the Engineer, in writing, at least 4 working days prior to completion of the work for each stage of an area and shall allow a minimum of 3 working days for the inspection.

Progress inspections will be performed at the following stages of work:

A. During pressure testing of the pipelines on the supply side of control valves.
B. During testing of low voltage conductors.
C. Before planting begins and after completion of the work specified for planting in Section 20-4.03, "Preparing Planting Areas," of the Standard Specifications.
D. Before plant establishment work begins and after completion of the work specified for planting in Section 20-4.05, "Planting," of the Standard Specifications.
E. At intervals of one month during the plant establishment period.

COST BREAK-DOWN

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum items of highway planting and irrigation system. Cost break-down tables shall be submitted to the Engineer for approval within 30 working days after the contract has been approved. Cost break-down tables will be approved, in writing, by the Engineer before any partial payment will be made for the applicable items of highway planting and irrigation system involved.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Cost break-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break-downs to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-downs submitted to the Engineer for approval. The Contractor

shall be responsible for the accuracy of the quantities and values used in the cost break-downs submitted for approval.

The sum of the amounts for the line items of work listed in each cost break-down table for highway planting and for irrigation system work shall be equal to the contract lump sum price bid for Highway Planting and Irrigation System, respectively. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in a cost break-down table.

No adjustment in compensation will be made in the contract lump sum prices paid for highway planting and irrigation system due to differences between the quantities shown in the cost break-downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum items of highway planting and irrigation system due to changes in line items of work ordered by the Engineer. When the total of ordered changes to line items of work increases or decreases the lump sum price bid for either Highway Planting or Irrigation System by more than 25 percent, the adjustment in compensation for the applicable lump sum item will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

HIGHWAY PLANTING COST BREAK-DOWN

Contract No. 08-368504

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
ROADSIDE CLEARING	LS	LUMP SUM		
COMMERCIAL FERTILIZER (GRANULAR)	LB	378		
IRON SULFATE	LB	585		
PLANT GROUP A	EA	192		
PLANT GROUP B	EA	585		
PLANT GROUP D-1	EA	28		
PLANT GROUP D-2	EA	56		
PLANT GROUP K	EA	143		
PLANT GROUP U	EA	176		
STEEL STAKE	EA	570		

TOTAL _____

IRRIGATION SYSTEM COST BREAK-DOWN

Contract No. 08-368504

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
CONTROL AND NEUTRAL CONDUCTORS	LS	LUMP SUM		
1 1/2" ELECTRIC REMOTE CONTROL VALVE	EA	21		
2" ELECTRIC REMOTE CONTROL VALVE (MASTER)	EA	1		
30 STATION IRRIGATION CONTROLLER (WALL MOUNTED)	EA	1		
1" PLASTIC PIPE (SCH 40) SUPPLY LINE	LF	23370		
1 1/2" PLASTIC PIPE (SCH 40) SUPPLY LINE	LF	6340		
2" PLASTIC PIPE (SCH 40) SUPPLY LINE	LF	400		
2 1/2" PLASTIC PIPE (PR 315) SUPPLY LINE	LF	3500		
2" FILTER ASSEMBLY UNIT	EA	1		
SPRINKLER (TYPE C-2)	EA	1323		
2" WYE STRAINER	EA	6		
2" BALL VALVE	EA	6		
2 1/2" GATE VALVE	EA	7		
REMOTE CONTROL VALVE ACTUATOR SYSTEM	EA	1		
FILTER ASSEMBLY UNIT ENCLOSURE	EA	1		
2" PRESSURE REDUCING VALVE	EA	1		
1" QUICK COUPLING VALVE ASSEMBLY	EA	6		
IRRIGATION CONTROLLER ENCLOSURE CABINET	EA	1		
FILTER ASSEMBLY UNIT BLANKET	EA	1		

TOTAL _____

10-2.02 (BLANK)

10-2.03 (BLANK)

10-2.04 HIGHWAY PLANTING

The work performed in connection with highway planting shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

HIGHWAY PLANTING MATERIALS

Commercial Fertilizer (Granular)

Commercial fertilizer (granular) shall be a pelleted or granular form and shall fall within 20 percent of the following guaranteed chemical analysis:

Ingredient	Percentage
Nitrogen	6
Phosphoric Acid	20
Water Soluble Potash	20

Commercial Fertilizer (Slow Release)

Commercial fertilizer (slow release) shall be a pelleted or granular form, shall be slow or controlled release with a nutrient release over an 8-month to 12-month period, and shall fall within the following guaranteed chemical analysis range:

Ingredient	Percentage
Nitrogen	16-21
Phosphoric Acid	6-8
Water Soluble Potash	4-10

OCOTILLO PLANTING (PLANT GROUP D-1) and (PLANT GROUP D-2)

Plant (Group D-1) and Plant (Group D-2) planting shall consist of obtaining, transporting and planting Fouquieria splendens (Ocotillo) plants in conformance with the provisions in Section 20-4, "Highway Planting," of the Standard Specifications, these special provisions and as shown on the plans.

Bare root Ocotillo plants shall not be removed from their original locations more than five calendar days prior to planting. At the option of the Contractor, container sized plants may be substituted for bare root plants provided they meet the requirements as shown on the plans.

Ocotillo plants shall be approved for use by the Engineer prior to planting.

Ocotillo plants on the project site that cannot be planted on the same day shall be stored by the Contractor and maintained in such a manner that the plants are kept cool and moist and plant roots are not allowed to dry.

Backfill material for plant holes shall be a mixture of soil and other materials shown on the Plant List. Iron sulfate shall be added to backfill material at the rate shown on the plans, no more than five working days prior to planting. Backfill material shall be thoroughly mixed and uniformly distributed without clods and lumps.

ROADSIDE CLEARING

Before preparing planting areas and wild flower seeding areas, or commencing irrigation trenching operations for planting areas, trash and debris shall be removed from these areas as required under Construction Site Management of these special provisions.

The project area shall be cleared as specified herein:

A. Weeds shall be killed and removed within an area 6 feet in diameter centered at each plant location where the plants are to be planted more than 15 feet apart and are located outside of gravel mulch areas.
B. Weeds shall be killed and removed from within areas where gravel mulch and rock blanket are to be placed.

After the initial roadside clearing is complete, additional roadside clearing work shall be performed as necessary to maintain the areas, as specified above, in a neat appearance until the start of the plant establishment period. This work shall include the following:

A. Trash and debris shall be removed.
B. Rodents shall be controlled.

C. Weed growth shall be killed before the weeds reach the seed stage of growth or exceed 6 inches in length, whichever occurs first.

Weed Control

Weed control shall also conform to the following:

A. Stolon type weeds shall be killed with glyphosate.
B. Tumbleweeds shall be removed by hand pulling before the tumbleweeds reach a height of 6 inches.
C. Removed weeds and ground cover shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Roadside clearing work shall not include work required to be performed as clearing and grubbing as specified in Section 16, "Clearing and Grubbing," of the Standard Specifications.

PESTICIDES

Pesticides used to control weeds shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications. Except as otherwise provided in these special provisions, pesticide use shall be limited to the following materials:

Aminopyralid
Diquat
Dithiopyr
Clopyralid MEA
Fluazifop-P-Butyl
Flumioxazin
Glyphosate
Imazapyr
Isoxaben (Preemergent)
Oryzalin (Preemergent)
Oxyfluorfen (Non-odor type)
Pendimethalin (Preemergent)
Prodiamine (Preemergent)
Sethoxydim

Glyphosate shall be used to kill stolon type weeds.

If the Contractor elects to request the use of other pesticides on this project, the request shall be submitted, in writing, to the Engineer not less than 15 days prior to the intended use of the other pesticides. Except for the pesticides listed in these special provisions, no pesticides shall be used or applied without prior written approval of the Engineer.

Pesticides shall not be applied in a manner that allows the pesticides to come in contact with the foliage and woody parts of the plants.

PLANTING

Apply or place commercial fertilizer (granular) and iron sulfate at the time of planting and at the rates shown on the Plant List.

Mulch is not required in the plant basins when mulch is not indicated on the Plant List for the plants involved.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions regarding functional tests of the irrigation systems. Do not perform planting in an area until the functional test has been completed for the irrigation system serving that area.

Steel Stakes

Steel stakes or galvanized steel chain link fence posts as specified in Section 80 of the Standard Specifications shall be substituted for stakes specified in Section 20-4.05, "Planting," of the Standard Specifications in conformance with these special provisions.

Steel stakes shall be the "The R2 System" manufactured by J.R. Partners or equal. Steel stakes or galvanized steel chain link fence posts for tree sizes up to and including 15 gallon size shall have a nominal dimension of 6 feet in length and have a minimum nominal diameter of 3/4 inch for steel stakes and 1 ½ inch internal diameter for

galvanized steel chain link fence posts. Steel stakes or galvanized steel chain link fence posts for greater than 15 gallon size up to and including 2-foot boxes shall have a nominal dimension of 9 feet in length and have a minimum nominal diameter of one inch for steel stakes and 2 inch internal diameter for galvanized steel chain link fence posts.

Two steel stakes or two galvanized steel chain link fence posts shall be installed per plant. Steel stakes shall be installed in conformance with the manufacturer's instructions except that the adjustable support shall be installed at the lowest position which will support the plant in an upright position. A copy of the manufacturer's instructions shall be furnished to the Engineer prior to steel stake installation.

PLANT ESTABLISHMENT WORK

The plant establishment period shall be Type 2 and shall not be less than 250 working days.

Attention is directed to "Relief From Maintenance and Responsibility" in these special provisions regarding relief from maintenance and protection.

Commercial fertilizer (slow release) shall be applied to trees, shrubs, vines and ground cover during the first week of March, July and October of each year. Commercial fertilizer shall be applied at the rates shown on the plans and shall be spread with a mechanical spreader wherever possible.

Weeds within an area 6 feet in diameter centered at each plant location outside of gravel mulch shall be controlled by killing.

Weeds within gravel mulch areas shall be controlled by killing.

Except as specified in these special provisions, disposal of mowed material will not be required unless ordered by the Engineer. Disposal of mowed material, as directed by the Engineer, will be paid for as extra work as provided in Section 4-1.03D,"Extra Work," of the Standard Specifications.

At the option of the Contractor, plants of a larger container size than those originally specified may be used for replacement plants during the first 125 working days of the plant establishment period.

After 125 working days of the plant establishment period have been completed, replacement of plants, 5-gallon size for one-gallon size plants; 15-gallon size for 5-gallon size plants; and other plant replacement plants shall be the same size as originally specified.

When ordered by the Engineer, one application of a preemergent pesticide conforming to the provisions in "Pesticides" of these special provisions, shall be applied between 40 working days and 50 working days prior to completion of the plant establishment period. This work will be paid for as extra work as provided in Section 4-1.03D,"Extra Work," of the Standard Specifications.

Wye strainers shall be cleaned at least 15 days prior to the completion of the plant establishment period.

Previously installed filters shall be removed, cleaned and reinstalled at least 15 days prior to the completion of the plant establishment period.

The final inspection shall be performed in conformance with the provisions in Section 5-1.13, "Final Inspection," of the Standard Specifications and shall be completed a minimum of 20 working days before the estimated completion of the contract.

10-2.05 IRRIGATION SYSTEMS

Irrigation systems shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, except materials containing asbestos fibers shall not be used.

Method A pressure testing shall conform to the provisions in Section 20-5.03H(1), "Method A," of the Standard Specifications, except leaks that develop in the tested portion of the system shall be located and repaired after each test period when a drop of more than 5 pounds per square inch is indicated by the pressure gage. After the leaks have been repaired, the one hour pressure test shall be repeated and additional repairs made until the drop in pressure is 5 pounds per square inch or less.

VALVE BOXES

Valve boxes shall conform to the provisions in Section 20-2.24, "Valve Boxes," of the Standard Specifications, except as otherwise provided herein.

Valve boxes shall be precast portland cement concrete.

Covers for concrete valve boxes shall be cast iron or steel. Valve boxes shall be identified on the top surface of the covers by labels containing the appropriate abbreviation for the irrigation facility contained in the valve box as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). Labels for valve boxes shall conform to the provisions in Section 20-5.03F, "Valves and Valve Boxes," of the Standard Specifications.

Label material shall be plate plastic or polyurethane.

BALL VALVES

Ball valves shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Ball valves shall be manufactured from Chlorinated Polyvinyl Chloride (CPVC) or polyvinyl chloride (PVC) and shall conform to the following:

Specification	Minimum Requirement
Non-shock cold water working pressure for 3/4-inch to 4-inch valves	235 psi
Non-shock cold water working pressure for 6-inch valves	150 psi
Seats	PTFE (Teflon)
O-Ring Seals	EPDM or Viton

Ball valves shall be of the same size as the pipeline which the valves serve, unless otherwise noted on the plans.

Ball valves shall be installed in a valve box.

GATE VALVES

Gate valves shall be as shown on the plans and in conformance with the provisions in Section 20-2.28, "Gate Valves," of the Standard Specifications and these special provisions.

Gate valves, smaller than 3 inches in size, shall be furnished with a cross-handle.

Gate valves shall have a solid bronze or brass wedge.

ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

Irrigation Controllers

Irrigation controllers shall be single, solid-state independent controllers conforming to the following:

A. Irrigation controllers shall be fully automatic and shall operate a complete 14-day or longer irrigation program.
B. The controller shall have a water budget capacity in 1 percent increments ranging from 1 percent to 255 percent. A device shall be provided on the face of the control panel that will turn the irrigation controller "on" or "off" and provide for automatic or manual operation. Manual operation shall allow cycle start at the desired station and shall allow activation of a single station.
C. The watering time of each station shall be displayed on the face of the control panel.
D. The irrigation controller and the low voltage output source shall be protected by fuses or circuit breakers.
E. The irrigation controller mechanism, panel and circuit board shall be connected to the low voltage control and neutral conductors by means of plug and receptacle connectors located in the irrigation controller enclosure.
F. Each station shall have a variable or incremental timing adjustment with a range of 24 hours to a minimum of one minute.
G. Irrigation controllers shall be capable of 4 independent 2 program schedules that can operate concurrently.
H. Irrigation controllers shall have an output that can energize a pump start circuit or a remote control valve (master) and shall have memory backup activated by rechargeable batteries.
I. Irrigation controllers shall be manufactured by the same company.
J. Where direct burial conductors are to be connected to the terminals strip, the conductors shall be connected with the proper size open-end crimp-on wire terminals. No exposed wire shall extend beyond the crimp of the terminal and the wires shall be parallel on the terminal strip.

Attention is directed to the provisions in "Systems Domestic Water System Control Panel," of these special provisions regarding electrical power for irrigation controllers and irrigation controller enclosure cabinets.

Electric Remote Control Valves

Electric remote control valves shall conform to the provisions in Section 20-2.23, "Control Valves," of the Standard Specifications and the following:

A. Valves shall be glass filled nylon, construction and shall be capable of operating within a cold water working pressure range of 20 to 200 PSI.

B. Valves shall or straight pattern (side inlet) as shown on the plans.

Pull Boxes

Pull box installations shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduits and Pull Boxes," of the Standard Specifications.

Conductors

Low voltage, as used in this section "Conductors," shall mean 36 V or less. Conductors shall be a minimum number 14 size solid wire.

Low voltage control and neutral conductors in pull boxes and valve boxes, at irrigation controller terminals, and at splices shall be marked as follows:

A. Conductor terminations and splices including non-spliced conductors in pull boxes shall be marked with adhesive backed paper markers or adhesive cloth wrap-around markers, with clear, heat-shrinkable sleeves sealed over the markers.

Markers for the control conductors shall be identified with the appropriate number or letter designations of irrigation controllers and station numbers. Markers for neutral conductors shall be identified with the appropriate number or letter designations of the irrigation controllers.

The color of low voltage neutral and control conductor insulation, except for the striped portions, shall be homogeneous throughout the entire thickness of the insulation.

Insulation for conductors may be UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 41 mils for wire sizes 10AWG and smaller.

Type "C," Type "S" or Type "T" splices shall be used. Splices for low voltage control and neutral conductors shall conform to provisions in Section 86-2.09C, "Connector and Terminals," Section 86-2.09D, "Splicing," and Section 86-2.09E, "Splice Insulation," of the Standard Specifications, except Type "S" splices shall be soldered.

REMOTE CONTROL VALVE ACTUATOR SYSTEM

A remote control valve actuator system shall consist of a receiver dome antenna mounted on the top surface of each irrigation controller enclosure cabinet, two hand held transmitters, field carrying cases, an AC power charging unit, and a controller/antenna connector. The remote control valve actuator equipment shall interface with a radio remote receiver card with each irrigation controller. The receiver and transmitter shall comply with Federal Communications Commission (FCC) Rules and Regulations, Part 15, as of the date of manufacture.

The receiver card shall be inserted into irrigation controller and shall operate the stations of the irrigation controller on radio signals from the transmitter. The receiver shall receive radio signals at a minimum distance of one mile. Receiver circuitry shall be protected from overload by a field replaceable fuse.

The transmitter shall provide a FM, radio signal for a minimum range of one mile to each radio remote receiver card located within each irrigation controller. The transmitter shall have a digital key pad and instant actuation of the stations or master valves in random, numerical or reverse numerical sequence. The transmitter shall allow for remote and manual control and two-way voice communication. The transmitter shall operate a master valve or pump independently of the controller stations. The transmitter shall transmit an FM radio frequency of 460 MHz.

The power source for the transmitter shall consist of an internal charged battery pack which shall be recharged by the charging unit. The charging unit shall have an input of 110 V(ac) and an output of 12 V(dc).

The field carrying case shall allow complete and convenient operation of the unit while in the case.

PLANT ESTABLISHMENT WORK

The plant establishment period shall be Type 2 and shall not be less than 250 working days.

Attention is directed to "Relief From Maintenance and Responsibility" in these special provisions regarding relief from maintenance and protection.

Commercial fertilizer (slow release) shall be applied to trees, shrubs, vines and ground cover during the first week of March, July and October of each year. Commercial fertilizer shall be applied at the rates shown on the plans and shall be spread with a mechanical spreader wherever possible.

Weeds within an area 6 feet in diameter centered at each plant location outside of gravel mulch shall be controlled by killing.

Weeds within gravel mulch areas shall be controlled by killing.

Except as specified in these special provisions, disposal of mowed material will not be required unless ordered by the Engineer. Disposal of mowed material, as directed by the Engineer, will be paid for as extra work as provided in Section 4-1.03D,"Extra Work," of the Standard Specifications.

At the option of the Contractor, plants of a larger container size than those originally specified may be used for replacement plants during the first 125 working days of the plant establishment period.

After 125 working days of the plant establishment period have been completed, replacement of plants, 5-gallon size for one-gallon size plants; 15-gallon size for 5-gallon size plants; and other plant replacement plants shall be the same size as originally specified.

When ordered by the Engineer, one application of a preemergent pesticide conforming to the provisions in "Pesticides" of these special provisions, shall be applied between 40 working days and 50 working days prior to completion of the plant establishment period. This work will be paid for as extra work as provided in Section 4-1.03D,"Extra Work," of the Standard Specifications.

Wye strainers shall be cleaned at least 15 days prior to the completion of the plant establishment period.

Previously installed filters shall be removed, cleaned and reinstalled at least 15 days prior to the completion of the plant establishment period.

The final inspection shall be performed in conformance with the provisions in Section 5-1.13, "Final Inspection," of the Standard Specifications and shall be completed a minimum of 20 working days before the estimated completion of the contract.

IRRIGATION CONTROLLER ENCLOSURE CABINET

Irrigation controller enclosure cabinets shall be constructed and equipment installed in the cabinets in conformance with the details shown on the plans, the provisions of Section 86-3.04A, "Cabinet Construction," of the Standard Specifications, and these special provisions.

Electric service shall be installed in accordance with "Electric Service (Irrigation)" of these special provisions.

Irrigation controller enclosure cabinets shall be provided with cross ventilation, roof ventilation or a combination of both. The ventilation shall not compromise the weather resistance properties of the irrigation controller enclosure cabinets and shall be fabricated by the manufacturer.

The anchorage arrangement shall be inside the cabinet as shown on the plans. Dimensions of the cabinet shall be suitable for the equipment to be installed as shown on the plans and specified in these special provisions.

Irrigation controller enclosure cabinet dimensions for a single irrigation controller shall be 60 inches (Height) x 36 inches (Width) x 12 inches (Depth).

Irrigation controller enclosure cabinets shall be fabricated in conformance with the provisions in Section 86-3.04A, "Cabinet Construction," of the Standard Specifications.

Irrigation controller enclosure cabinets shall be fabricated of stainless steel.

Irrigation controller enclosure cabinets fabricated of cold rolled steel or aluminum shall be cleaned and painted by the manufacturer in conformance with the provisions in Section 86-3.04A, "Cabinet Construction," of the Standard Specifications. The finish color of the irrigation controller enclosure cabinets shall be a tan to light brown closely matching Federal Standard 595B, Color No. 20450.

Irrigation controller enclosure cabinet doors shall not be furnished with integral door locks. Irrigation controller enclosure cabinet door handles shall have provisions for padlocking in the latched position. Padlocks will be furnished by the Engineer.

Mounting panels shall be fabricated of stainless steel metal sheets with a minimum thickness of 0.157 inch.

Inside of the doors shall have provisions for storage of the irrigation plans.

Solid-state automatic shut-off rain sensor units shall be installed for the irrigation controller enclosure cabinets. Rain sensor units shall automatically interrupt the master remote control valves when approximately 1/8 inch of rain has fallen. The irrigation system shall automatically be enabled again when the accumulated rainfall evaporates from the rain sensor unit collection cup. Rain sensor units shall be rated 24 V (ac) to 30 V (ac). Static charge protection shall be included to protect against lightning damage.

Equipment, except for field wiring, shall be installed in the cabinet in a shop prior to field installation.

IRRIGATION SYSTEMS FUNCTIONAL TEST

Functional tests for the irrigation controllers and associated automatic irrigation systems shall conform to the provisions in Section 20-5.027J, "Testing," of the Standard Specifications and these special provisions.

Tests shall demonstrate to the Engineer, through one complete cycle of the irrigation controllers in the automatic mode, that the associated automatic components of the irrigation systems operate properly. If automatic components of the irrigation systems fail a functional test, these components shall be repaired at the Contractor's expense and the testing repeated until satisfactory operation is obtained.

Associated automatic components shall include, but not be limited to, remote control valve actuator systems, remote control valves, and rain sensors.

Upon completion of work on an irrigation system, including correction of deficiencies and satisfactory functional tests for the systems involved, the plants to be planted in the area watered by the irrigation system may be planted provided the planting areas have been prepared as specified in these special provisions.

PIPE

Steel Pipe

Galvanized steel pipe supply lines must be installed not less than 18 inches below finished grade, measured to the top of the pipe.

Plastic Pipe

Plastic pipe supply lines must be polyvinyl chloride (PVC) 1120 or 1220 pressure rated pipe with the minimum pressure rating (PR) shown on the plans.

Plastic pipe supply lines less than 3 inches in diameter must have solvent cemented type joints. Primers must be used on the solvent cemented type joints.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 must be Schedule 80.

SPRINKLERS

Sprinklers shall conform to the type, pattern, material, and operating characteristics listed in the "Sprinkler Schedule" shown on the plans.

WYE STRAINERS

Wye strainers shall be installed on the upstream side of the electric remote control valves as shown on the plans.

Removable stainless steel strainers for wye strainers shall be 40 size mesh.

When garden valves are opened, discharge shall be up and out of the valve box.

FILTER ASSEMBLY UNIT

Each filter assembly unit shall be the inline type and shall be installed in conformance with the plans, and these special provisions.

The filter assembly unit shall consist of a filter unit, 2-gate valves, 2-pressure gages, galvanized steel pipe and fittings and appurtenances necessary for satisfactory operation of the filter assembly unit.

The filter assembly unit housing shall be manufactured of carbon steel and shall be capable of withstanding a cold water working pressure of 150 PSI. The housing shall be cylindrical in shape.

The filter unit shall be self-flushing and shall have two filters, coarse and fine with a minimum zigzag screening area of 713 square inches. The maximum allowable safe flow shall be 110 gallons per minute. The coarse filter shall be manufactured of plastic and the fine filter shall be perforated plastic. The filter cylinder shall be lined with a pleated stainless steel corrosion-resistant screen capable of 80 mesh filtration.

Pressure gages shall be hermetically sealed with neoprene and shall have watertight polycarbonate cases and covers with molded clear polycarbonate windows. Gages shall be 2 inches in diameter, calibrated from 0 to 160 Psi and have black aluminum pointers that contrast with gage faces and have brass stems. Internal gage parts shall be brass and phosphor bronze.

FILTER ASSEMBLY UNIT ENCLOSURE

Enclosures shall be fabricated of structural steel angles and metal sheet steel and shall be installed over filter assemblies on a portland cement concrete pad as shown on the plans and in conformance with these special provisions.

Metal for sides, ends and top panels shall be solid and shall be fabricated from 12 -gage minimum thickness, cold rolled steel. Solid metal panels shall be attached to the 3/16-inch thick steel angle frames by a series of welds, not less than 1/4-inch in length and spaced not more than 4-inches on center, along the edges of the enclosure.

Lock-guard shall be made of a minimum thickness of 3/16-inch cold rolled steel.

Padlocks will be furnished by the Engineer.

Enclosures shall be galvanized, after fabrication, in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Hold down bolt assemblies shall be galvanized and shall be installed when the portland cement concrete pad is still plastic. Nuts shall be hexagonal and washers shall be the lock type.

Enclosures shall be painted by the manufacturer with one application of a commercial quality pre-treatment, vinyl wash primer and a minimum of one application of a commercial quality, exterior enamel for metal. The finish color shall be a tan to light brown closely matching Federal Standard No. 595B, Color No. 20450.

All parts of the filter assembly unit enclosure, including hold down assemblies, may be constructed of stainless steel instead of standard steel materials specified above. Stainless steel enclosures shall conform to the provisions herein except galvanizing, priming and painting shall not be required. Stainless steel enclosures shall be powder coated a tan to light brown color closely matching Federal Standard 595B, Color No. 20450, by the manufacturer.

Lock-guard for stainless steel enclosures shall be 12-gage stainless steel, Type 304.

FILTER ASSEMBLY UNIT BLANKET

Filter assembly unit blankets on new filter assembly unit enclosure shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Blankets shall be vinyl coated or polymeric resin coated polyester fabric. Blanket insulation shall have a minimum R-value of 19. The outer fabric of the blankets shall be brown and UV, water, mildew and flame resistant.

Blankets shall be installed on all interior surfaces of the enclosure in conformance with the manufacturer's instructions. One copy of the manufacturer's instructions shall be furnished to the Engineer.

PRESSURE REDUCING VALVE

Pressure reducing valves shall consist of pressure reducing valves, pressure gages, valve boxes with wire mesh and gravel or crushed rock, fittings, and pipe as shown on the plans.

Pressure reducing valves shall be the spring diaphragm type, manufactured of bronze or cast iron construction, hydraulically operated and pilot controlled, and shall have flanged or threaded pipe connections. Pressure reducing valves with threaded connections shall be installed with unions on the inlet side of the valves. Pressure reducing valves shall not have internal filter screens.

Pressure gages for pressure reducing valves shall be hermetically sealed with neoprene and shall have watertight polycarbonate cases and covers with molded clear polycarbonate windows. Gages shall be 2 inches in diameter, calibrated from 0 psi to 160 psi, and have black aluminum pointers that contrast with gage faces and have brass stems. Internal gage parts shall be brass and phosphor bronze.

Pressure reducing valves shall have an adjustable discharge pressure range of 10 psi to 125 psi.

FINAL IRRIGATION SYSTEM CHECK

A final check of existing and new irrigation facilities shall be performed not more than 40 working days and not less than 30 working days prior to acceptance of the contract.

The length of watering cycles for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to irrigation controllers shall be checked for automatic performance when the controllers are in automatic mode.

Unsatisfactory performance of irrigation facilities installed or modified by the Contractor shall be repaired and rechecked at the Contractor's expense until satisfactory performance is obtained, as determined by the Engineer.

Repair or replacement of existing irrigation facilities due to unsatisfactory performance shall conform to the provisions in "Existing Highway Irrigation Facilities" of these special provisions.

Nothing in this section "Final Irrigation System Check" shall relieve the Contractor of full responsibility for making good or repairing defective work or materials found before the formal written acceptance of the entire contract by the Director.

Full compensation for checking the irrigation systems prior to the acceptance of the contract shall be considered as included in the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

SECTION 10-3. ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Flashing beacon system, modyfy lighting, lighting and sign illumination, communication conduit and maintaining existing traffic management system elements during construction shall conform to the provisions in Section 86, "Electrical Systems," of the Standard Specifications and these special provisions.

10-3.02 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

The cost break-down shall include the following items in addition to those listed in the Standard Specifications:

A. LED Signal Modules

10-3.03 MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION

Traffic Management System (TMS) elements include, but are not limited to ramp metering (RM) system, communication system, traffic monitoring stations, video image vehicle detection system (VIVDS), microwave vehicle detection system (MVDS), loop detection system, changeable message sign (CMS) system, extinguishable message sign (EMS) system, highway advisory radio (HAR) system, closed circuit television (CCTV) camera system, roadway weather information system (RWIS), visibility sensor, and fiber optic system.

Existing TMS elements, including detection systems, identified on the plans and located within the project limits shall remain in place and be protected from damage. If the construction activities require existing TMS elements to be nonoperational or off line, and if temporary or portable TMS elements are not shown on the plans, the Contractor shall provide for temporary or portable TMS elements. The Contractor shall receive the Engineer's approval on the type of temporary or portable TMS elements and installation method.

Before work is performed, the Engineer, the Contractor, and the Department's Traffic Operations Electrical representatives shall jointly conduct a pre-construction operational status check of all existing TMS elements and each element's communication status with the Traffic Management Center (TMC), including existing TMS elements that are not shown on the plans and elements that may not be impacted by the Contractor's activities. The Department's Traffic Operations Electrical representatives will certify the TMS elements' location and status, and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components.

The Contractor shall obtain written approval from the Engineer at least 72 hours before interrupting existing TMS elements' communication with the TMC that will result in the elements being nonoperational or off line. The Contractor shall notify the Engineer at least 72 hours before starting excavation activities.

Traffic monitoring stations and their associated communication systems, which were verified to be operational during the pre-construction operational status check, shall remain operational on freeway/highway mainline at all times, except:

1. For a duration of up to 15 days on any continuous segment of the freeway/highway longer than 3 miles
2. For a duration of up to 60 days on any continuous segment of the freeway/highway shorter than 3 miles

If the construction activities require existing detection systems to be nonoperational or off line for a longer time period or the spacing between traffic monitoring stations is more than the specified criteria above, and temporary or portable detection operations are not shown on the plans, the Contractor shall provide provisions for temporary or portable detection operations. The Contractor shall receive the Engineer's approval on the type of detection and installation before installing the temporary or portable detection.

If existing TMS elements shown on the plans or identified during the pre-construction operational status check, except traffic monitoring stations, are damaged or fail due to the Contractor's activity, where the elements are not fully functional, the Engineer shall be notified immediately. If the Contractor is notified by the Engineer that existing TMS elements have been damaged, have failed or are not fully functional due to the Contractor's activity, the damaged or failed TMS elements, excluding structure-related elements, shall be repaired or replaced, at the Contractor's expense, within 24 hours. For a structure-related elements, the Contractor shall install temporary or portable TMS elements within 24 hours. For nonstructure-related TMS elements, the Engineer may approve temporary or portable TMS elements for use during the construction activities.

If fiber optic cables are damaged due to the Contractor's activities, the Contractor shall install new fiber optic cables from an original splice point or termination to an original splice point or termination, unless otherwise authorized in writing by the Engineer. Fiber optic cable shall be spliced at the splice vaults if available. The amount of new fiber optic cable slack in splice vaults and the number of new fiber optic cable splices shall be equivalent to the amount of slack and number of splices existing before the damage or as directed by the Engineer. Fusion splicing will be required.

The Contractor shall demonstrate that repaired or replaced elements operate in a manner equal to or better than the replaced equipment or as directed by the Engineer. If the Contractor fails to perform required repairs or replacement work, as determined by the Engineer, the State may perform the repair or replacement work and the cost will be deducted from monies due to the Contractor.

A TMS element shall be considered nonoperational or off line for the duration of time that active communications with the TMC is disrupted, resulting in messages and commands not transmitted from or to the TMS element.

The Contractor shall provide provisions for replacing existing TMS elements within the project limits, including detection systems, that were not identified on the plans or during the pre-construction operational status check that became damaged due to the Contractor's activities.

If the pre-construction operational status check identified existing TMS elements, then the Contractor, the Engineer, and the Department's Traffic Operations Electrical representatives shall jointly conduct a post construction operational status check of all existing TMS elements and each element's communication status with the TMC. The Department's Traffic Operations Electrical representatives will certify the TMS elements' status and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components. TMS elements that cease to be functional between pre and post construction status checks shall be repaired at the Contractor's expense and as directed by the Engineer.

The Engineer will approve, in writing, the schedule for final replacement, the replacement methods and the replacement elements, including element types and installation methods before repair or replacement work is performed. The final TMS elements shall be new and of equal or better quality than the existing TMS elements.

PAYMENT

The contract lump sum price paid for maintaining existing traffic management system elements during construction shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in maintaining existing traffic management system elements as shown on the plans, specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If no electrical work exists on the project and no TMS elements are identified within the project limits, the pre-construction operational status check will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements that are not shown on the plans, but are required when an existing TMS element becomes nonoperational or off line due to construction activities, will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements and replacing TMS elements that are not shown on the plans nor identified during the pre-construction operational status check and were damaged by construction activities will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

If the Contractor is required to submit provisions for the replacement of TMS elements that were not identified, the provisions will be paid for as extra work as provided in Section 4-l.03D, "Extra Work," of the Standard Specifications.

10-3.04 CONDUIT

Conduit to be installed underground shall be Type 3 Schedule 80 unless otherwise specified.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 3 Schedule 80.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

10-3.05 TRAFFIC PULL BOXES

Grout shall not be placed in the bottom of traffic pull boxes.

10-3.06 PULL BOX

GENERAL

Summary

This work includes installing a non-traffic-rated pull box as shown on the plans and as specified in these special provisions. Comply with Section 86-2.06, "Pull Boxes," of the Standard Specifications.

Submittals

Before shipping pull boxes to the jobsite, submit a list of materials, Contract number, pull box manufacturer, manufacturer's instructions for pull box installation, and your contact information to the Transportation Laboratory.

Submit reports for pull box from an NRTL-accredited lab to the Engineer.

Quality Control and Assurance

Pull boxes may be tested by the Department. Deliver pull boxes and covers to the Transportation Laboratory and allow 30 days for testing. When testing is complete, you will be notified. You must pick up the boxes and covers from the test site and deliver it to the job site.

Any failure of the pull box or the cover that renders the unit noncompliant with these specifications will be a cause for rejection. If the unit is rejected, you must allow 30 days for retesting. Retesting period starts when the replacement pull box is delivered to the test site. You must pay for all retesting costs. Delays resulting from submittal of noncompliant materials does not relieve you from executing the contract within the allotted time.

If the pull box submitted for testing does not comply with the specifications, remove the unit from the test site within 5 business days after notification that it is rejected. If the unit is not removed within that period, it may be shipped to you at your expense.

You must pay for all shipping, handling, and transportation costs related to the testing and retesting.

Functional Testing

The pull box and cover must be tested under ANSI/SCTE 77, "Specifications for Underground Enclosure Integrity."

Warranty

Provide a 2-year manufacturer replacement warranty for pull box and cover from the date of installation of the pull box and cover. All warranty documentation must be submitted to the Engineer before installation.

Replacement parts must be provided within 5 business days after receipt of failed pull box, cover, or both at no cost to the Department and must be delivered to the Department's Maintenance Electrical Shop at 175 Cluster Street, San Bernardino, CA 92408.

MATERIALS

The pull box and cover must comply with ANSI/SCTE 77, "Specifications for Underground Enclosure Integrity," for Tier 22 load rating and must be gray or brown in color.

Each pull box cover must have an electronic marker cast inside.

Extension for the pull box must be of the same material as the pull box and attached to the pull box to maintain the minimum combined depths as shown.

Include recesses for a hanger if a transformer or other device must be placed in a pull box.

The bolts, nuts, and washers must be a captive bolt design.

The captive bolt design must be capable of withstanding a torque range of 55 to 60 ft-lb and a minimum pull out strength of 750 lb. Perform the test with the cover in place and the bolts torqued. The pull box and cover must not be damaged while performing the test to the minimum pull out strength.

Stainless steel hardware must have an 18 percent chromium content and an 8 percent nickel content.

Galvanize ferrous metal parts under Section 75-1.05, "Galvanizing."

Manufacturer's instructions must provide guidance on:

1. Quantity and size of entries that can be made without degrading the strength of the pull box below Tier 22 load rating
2. Where side entries cannot be made
3. Acceptable method to be used to create the entry

Tier 22 load rating must be labeled or stenciled by the manufacturer on the inside and outside of the pull box and on the underside of the cover.

CONSTRUCTION

Do not install pull box in curb ramps or driveways.

A pull box for a post or a pole standard must be located within 5 feet of the standard. Place a pull box adjacent to the back of the curb or edge of the shoulder. If this is impractical, place the pull box in a suitable, protected, and accessible location.

Bury pull box in soil 6 inches to 8 inches below grade. Cover the pull box with a plastic sheet before burying it.

Plastic sheets must be 20 mil thick and made of HDPE or PVC virgin compounds.

10-3.07 CONDUCTORS, CABLES, AND WIRING

Splices shall be insulated by "Method B."

Conductors and cables shall be secured to the projecting end of conduit in pull boxes to prevent pulling of cables without removing the securing device.

10-3.08 LED LUMINAIRES

GENERAL

Summary

This work includes installing LED luminaires. Comply with Section 86, "Electrical Systems," of the Standard Specifications.

Definitions

CALiPER: Commercially Available LED Product Evaluation and Reporting. A U.S. DOE program that individually tests and provides unbiased information on the performance of commercially available LED luminaires and lights.

correlated color temperature: Absolute temperature in kelvin of a blackbody whose chromaticity most nearly resembles that of the light source.

house side lumens: Lumens from a luminaire directed to light up areas between the fixture and the pole (e.g., sidewalks at intersection or areas off of the shoulders on freeways).

International Electrotechnical Commission (IEC): Organization that prepares and publishes international standards for all electrical, electronic and related technologies.

junction temperature: Temperature of the electronic junction of the LED device. The junction temperature is critical in determining photometric performance, estimating operational life, and preventing catastrophic failure of the LED.

L70: Extrapolated life in hours of the luminaire when the luminous output depreciates 30 percent from initial values.

LM-79: Test method from the Illumination Engineering Society of North America (IESNA) specifying test conditions, measurements, and report format for testing solid state lighting devices, including LED luminaires.

LM-80: Test method from the IESNA specifying test conditions, measurements, and report format for testing and estimating the long term performance of LEDs for general lighting purposes.

National Voluntary Laboratory Accreditation Program (NVLAP): U.S. DOE program that accredits independent testing laboratories to qualify.

power factor: Ratio of the real power component to the complex power component.

street side lumens: Lumens from a luminaire directed to light up areas between the fixture and the roadway (e.g., traveled ways, freeway lanes).

surge protection device (SPD): Subsystem or component that can protect the unit against short duration voltage and current surges.

total harmonic distortion: Ratio of the rms value of the sum of the squared individual harmonic amplitudes to the rms value of the fundamental frequency of a complex waveform.

Submittals

Submit a sample luminaire to the Transportation Laboratory for testing after the manufacturer's testing is completed. Include the manufacturer's testing data.

Product submittals must include:

1. LED luminaire checklist.
2. Product specification sheets, including:

    2.1. Maximum power in watts.
    2.2. Maximum designed junction temperature.
    2.3. Heat sink area in square inches.
    2.4. Designed junction to ambient thermal resistance calculation with thermal resistance components clearly defined.
    2.5. L70 in hours when extrapolated for the average nighttime operating temperature.

3. IES LM-79 and IES LM-80 compliant test reports from a CALiPER-qualified or NVLAP-approved testing laboratory for the specific model submitted.
4. Photometric file based on LM-79 test report.
5. Initial and depreciated isofootcandle diagrams showing the specified minimum illuminance for the particular application. The diagrams must be calibrated to feet and show a 40' x 40' grid. The diagrams must be calibrated to the mounting height specified for that particular application. The depreciated isofootcandle diagrams must be calculated at the minimum operational life.
6. Test report showing SPD performance as tested under ANSI/IEEE C62.41.2 and ANSI/IEEE C62.45.
7. Test report showing mechanical vibration test results as tested under California Test 611 or equal.
8. Data sheets from the LED manufacturer that include information on life expectancy based on junction temperature.
9. Data sheets from power supply manufacturer that include life expectancy information.

Submit documentation of a production QA performed by the luminaire manufacturer that ensures the minimum performance levels of the modules comply with these specifications and includes a documented process for resolving problems.

Submit warranty documentation before installing LED luminaires.

Quality Control and Assurance

General

The Department may perform random sample testing on the shipments. The Department completes testing within 30 days after delivery to Transportation Laboratory. Luminaires are tested under California Test 678. All parameters specified in these specifications may be tested on the shipment sample. When testing is complete, the Department notifies you. Pick up the equipment from the test site and deliver to the job site.

One sample luminaire must be fitted with a thermistor or thermo-couple temperature sensor. A temperature sensor must be mounted on the LED solder pad as close to the LED as possible. A temperature sensor must be mounted on the power supply case. Light bar or modular systems must have 1 sensor for each module mounted as close to the center of the module as possible. Other configurations must have at least 5 sensors per luminaire. Contact the Transportation Laboratory for advice on sensor location. Thermocouples must be either Type K or C. Thermistors must be a negative temperature coefficient type with a nominal resistance of 20 kΩ. The appropriate thermocouple wire must be used. The leads must be a minimum of 6 feet. Documentation must accompany the test unit that details the type of sensor used.

The sample luminaires must be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of +70 °F before performing any testing.

The luminaire lighting performance must be depreciated for the minimum operating life by using the LED manufacturer's data or the data from the LM-80 test report, whichever results in a higher lumen depreciation.

Failure of the luminaire that renders the unit noncompliant with these specifications is cause for rejection. If a unit is rejected, allow 30 days for retesting. The retesting period starts when the replacement luminaire is delivered to the test site.

If a luminaire submitted for testing does not comply with these specifications, remove the unit from the Transportation Laboratory within 5 business days after notification that it is rejected. If the unit is not removed within that period, the Department may ship the unit to you and deduct the cost.

Warranty

Furnish a 7-year replacement warranty from the manufacturer of the luminaires against any defects or failures. The effective date of the warranty is the date of installation. Furnish replacement luminaires within 10 days after receipt of the failed luminaire. The Department does not pay for the replacement. Deliver replacement luminaires to the following department maintenance electrical shop:

District 8 North Region Maintenance-MS 9
175 West Cluster Street
San Bernardino, CA 92408

MATERIALS

General

The luminaire must include an assembly that uses LEDs as the light source. The assembly must include a housing, an LED array, and an electronic driver. The luminaire must:

1. Be UL listed under UL 1598 for luminaires in wet locations or an equivalent standard from a recognized testing laboratory
2. Have a minimum operational life of 63,000 hours
3. Operate at an average operating time of 11.5 hours per night
4. Be designed to operate at an average nighttime operating temperature of 70 °F
5. Have an operating temperature range from -40 to +130 °F
6. Be defined by the following application:

Application	Replaces
Roadway 1	200 Watt HPS mounted at 34 ft
Roadway 2	310 Watt HPS mounted at 40 ft

The individual LEDs must be connected such that a catastrophic loss or a failure of 1 LED does not result in the loss of more than 20 percent of the luminous output of the luminaire.

Luminaire Identification

Each luminaire must have the following identification permanently marked inside the unit and outside of its packaging box:

1. Manufacturer's name
2. Trademark
3. Model no.
4. Serial no.
5. Date of manufacture (month-year)
6. Lot number
7. Contract number
8. Rated voltage
9. Rated wattage
10. Rated power in VA

Electrical

The luminaire must operate from a 60 ± 3 Hz AC power source. The fluctuations of line voltage must have no visible effect on the luminous output. The operating voltage must range from 120 to 480 V(ac). The luminaire must operate over the entire voltage range or the voltage range may be selected from either of the following options:

1. Luminaire must operate over a voltage range of 95 to 277 V(ac). The operating voltages for this option are 120 V(ac) and 240 V(ac).
2. Luminaire must operate over a voltage range of 347 to 480 V(ac). The operating voltage for this option is 480 V(ac).

The power factor of the luminaire must be 0.90 or greater. Total harmonic distortion, current and voltage, induced into an AC power line by a luminaire must not exceed 20 percent. The maximum power consumption allowed for the luminaire must be as shown in the following table:

Application	Maximum Consumption (Watts)
Roadway 1	165
Roadway 2	235

Surge Suppression and Electromagnetic Interference

The luminaire on-board circuitry must include an SPD to withstand high repetition noise transients caused by utility line switching, nearby lightning strikes, and other interferences. The SPD must protect the luminaire from

damage and failure due to transient voltages and currents as defined in Tables 1 and 4 of ANSI/IEEE C64.41.2 for location category C-High. The SPD must comply with UL 1449. The SPD performance must be tested under ANSI/IEEE C62.45 based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High.

The luminaires and associated on-board circuitry must comply with the Class A emission limits provided in 47 CFR 15, subpart B concerning the emission of electronic noise.

Compatibility

The luminaire must be operationally compatible with currently used lighting control systems and photoelectric controls.

Photometric Requirements

The luminaire must maintain a minimum illuminance level throughout the minimum operating life. The L70 of the luminaire must be the minimum operating life or greater. The measurements must be calibrated to standard photopic calibrations. The minimum maintained illuminance values, measured at a point, must be as shown in the following table:

Application	Mounting Height (ft)	Minimum Maintained Illuminance (fc)	Light Pattern Figure (isofootcandle curve)
Roadway 1	34	0.15	Pattern defined by an ellipse with the equation: $$\frac{x^2}{(82)^2} + \frac{(y-20)^2}{(52)^2} = 1$$ where: x =direction longitudinal to the roadway y = direction transverse to the roadway and the luminaire is offset from the center of the pattern by 20 feet to the house side of the pattern.
Roadway 2	40	0.2	Pattern defined by an ellipse with the equation: $$\frac{x^2}{(82)^2} + \frac{(y-20)^2}{(52)^2} = 1$$ where: x =direction longitudinal to the roadway y = direction transverse to the roadway and the luminaire is offset from the center of the pattern by 20 feet to the house side of the pattern.

The luminaire must have a correlated color temperature range from 3,500 to 6,500 K. The color rendering index must be 65 or greater.

The luminaire must not allow more than:

1. 10 percent of the rated lumens to project above 80 degrees from vertical
2. 2.5 percent of the rated lumens to project above 90 degrees from vertical

Thermal Management

The passive thermal management of the heat generated by the LEDs must have enough capacity to ensure proper operation of the luminaire over the minimum operation life. The LED maximum junction temperature for the minimum operation life must not exceed 221 °F.

The junction-to-ambient thermal resistance must be 95 °F per watt or less. The use of fans or other mechanical devices is not allowed. The heat sink material must be aluminum or other material of equal or lower thermal resistance.

The luminaire must contain circuitry that automatically reduces the power to the LEDs to a level that ensures the maximum junction temperature is not exceeded when the ambient outside air temperature is 100 °F or greater.

Physical and Mechanical Requirements

The luminaire must be a single, self-contained device, not requiring job site assembly for installation. The power supply for the luminaire is integral to the unit. The weight of the luminaire must not exceed 35 lb. The maximum effective projected area when viewed from either side or either end must be 1.4 sq ft. The housing color must match a color no. 26152 of FED-STD-595.

The housing must be fabricated from materials designed to withstand a 3,000-hour salt spray test under ASTM B 117. All aluminum used in housings and brackets must be of a marine grade alloy with less than 0.2 percent copper. All exposed aluminum must be anodized.

Each refractor or lens must be made from UV-inhibited high impact plastic such as acrylic or polycarbonate or heat- and impact-resistant glass, and be resistant to scratching. Polymeric materials except lenses of enclosures containing either the power supply or electronic components of the luminaire must be made of UL94VO flame retardant materials. Paint or powder coating of the housing must comply with section 86-2.16. A chromate conversion undercoating must be used underneath a thermoplastic polyester powder coat.

Each housing must be provided with a slip fitter capable of mounting on a 2-inch pipe tenon. This slip fitter must fit on mast arms with outside diameters from 1-5/8 to 2-3/8 inches. The slip fitter must be capable of being adjusted a minimum of ±5 degrees from the axis of the tenon in a minimum of five steps: +5, +2.5, 0, -2.5, -5. The clamping brackets of the slip fitter must not bottom out on the housing bosses when adjusted within the designed angular range. No part of the slip fitter mounting brackets on the luminaires must develop a permanent set in excess of 1/32 inch when the two or four 3/8-inch diameter cap screws used for mounting are tightened to 10 ft-lb. Two sets of cap screws may be furnished to allow the slip fitter to be mounted on the pipe tenon in the acceptable range without the cap screws bottoming out in the threaded holes. The cap screws and the clamping brackets must be made of corrosion resistant materials or treated to prevent galvanic reactions, and be compatible with the luminaire housing and the mast arm.

The assembly and manufacturing process for the LED luminaire must be designed to ensure internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources. When tested under California Test 611, the luminaire to be mounted horizontally on the mast arm must be capable of withstanding the following cyclic loading for a minimum of 2 million cycles without failure of any luminaire part:

Cyclic Loading

Plane	Power Supply	Minimum Peak Acceleration Level
Vertical	Installed	3.0 g peak-to-peak sinusoidal loading (same as 1.5 g peak)
Horizontal[a]	Installed	1.5 g peak-to-peak sinusoidal loading (same as 0.75 g peak)

[a]Perpendicular to direction of mast arm

The housing must be designed to prevent the buildup of water on top of the housing. Exposed heat sink fins must be oriented to allow the water to freely run off of the luminaire and carry dust and other accumulated debris away from the unit. The optical assembly of the luminaire must be protected against dust and moisture intrusion to at least an ANSI/IEC rating of IP66. The power supply enclosure must be protected to at least an ANSI/IEC rating of IP43.

Each mounted luminaire must be furnished with an ANSI C136.10-compliant, locking type photocontrol receptacle and a rain tight shorting cap. The receptacle must comply with Section 86-6.08A, "Types," of the Standard Specifications.

When the components are mounted on a down-opening door, the door must be hinged and secured to the luminaire housing separately from the refractor or flat lens frame. The door must be secured to the housing such that accidental opening is prevented. A safety cable must mechanically connect the door to the housing.

Field wires connected to the luminaire must terminate on a barrier type terminal block secured to the housing. The terminal screws must be captive and equipped with wire grips for conductors up to No. 6. Each terminal position must be clearly identified.

The power supply must be rated for outdoor operation and have at least an ANSI/IEC rating of IP65.

The power supply must be rated for a minimum operational life equal to the minimum operational life of the luminaire, or greater.

The power supply case temperature must have a self rise of 77 °F or less above ambient temperature in free air with no additional heat sinks.

The power supply must have 2 leads to accept standard 0-10 V(dc). Dimming control must be compatible with IEC 60929. If the control leads are open or the analog control signal is lost, the circuit must default to 100-percent power.

Conductors and terminals must be identified.

10-3.09 PHOTOELECTRIC CONTROLS

Contactors shall be the mechanical armature type.

10-3.10 WEIGH STATION BYPASS SYSTEM

GENERAL

Scope: This work shall consist of furnishing, installing and constructing a complete weigh station bypass system (WSBS) in accordance with the details shown on the plans and these special provisions.

The WSBS is part of the Heavy Vehicle Electronic License Plate (HELP) system that allows a truck with proper credentials and measured weight within limits to bypass the weigh station. The WSBS consist of high speed weigh in motion (WIM) system, automated vehicle identification (AVI) system and in-cab notification (ICN) system.

The high speed WIM system shall include single load cell scales as shown on the plans. The high speed WIM system shall include equipment and software for collecting, processing, storing, transmitting (to a host computer) and manipulating information related to the counting, classifying and speed monitoring of all vehicles and the weighing of trucks and buses. The WIM system shall be installed according to the manufacturer's specifications.

The WIM controller shall weigh each axle of a vehicle and pass that weight and axle spacing information to the AVI advance reader. The AVI advance reader shall identify the vehicle and pass a combined WIM/AVI record to the site computer. The site computer then analyzes the WIM, AVI and credential data, to determine the suitability of that vehicle for weigh station bypass. The site computer send an authorization bypass of denial message to the subject vehicle via the ICN reader. The AVI compliance reader shall also identify the vehicle and pass a record to the site computer which will confirm that the vehicle has a bypass authorization.

The Contractor shall provide that a technical representative of the truck WSB manufacturer be on call and available at the jobsite within 24 hours of being contacted during the construction, installation, adjusting and testing of the truck WSB system. The technical representative shall have full and complete knowledge of the installation and operation of the scale being installed.

SUBMITTALS

Operation and Maintenance Manuals:

The Contractor shall furnish a maintenance manual for the central unit, including vehicle detector sensor units, and an operation manual for the system. The maintenance and operation manual maybe combined into one manual.

The manual(s) shall include, but not limited to, the following equipment:

1. Specifications
2. Design characteristics
3. General operation theory
4. Function of all components
5. Trouble shooting procedures (diagnostic routine)
6. Block circuit diagram
7. Geographical layout of components
8. Schematic diagrams
9. List of component parts with stock numbers
10. Documentation for application software.

PRODUCTS AND EXECUTION

Trenching and installation of conduit

Installation of conduits and pipes from the weigh-in-motion scales between the edge of travel way and the edge of the shoulder shall be installed by "Trenching in Pavement Method," described in Section 86-2.05C of the Standard Specifications and these special provisions.

The trench shall not exceed 8 inches in width.

Concrete backfill shall be placed to the pavement surface except when the trench is in asphalt concrete pavement, the top 2 inches of the trench shall be backfilled with asphalt concrete produced from commercial paving asphalt and aggregates.

All excavated areas in the pavement shall be backfilled, except for the top 2 inches by the end of each work period.

Standards, Steel Pedestals and Posts

Standard for AVI antennas shall be modified signal standards as shown on the plans.

Conductors And Wiring

Splices shall be insulated by "Method B." Splices of loops wires to the detector lead-in cables shall be as recommended by WIM manufacturer.

Control Cable

Control cable shall be fiber optic, six strands, gel filled, loose tube buffer and shall comply with the following table:

Type	62.5/125
Nominal Diameter	0.34 inch max
Minimum Bending Radius	2.0 inch
Attenuation	5.6 max. 4.7 typical dB/km @ 850 nm 1.6 max. 1.5 typical dB/km @1300 nm
Bandwidth	160 MHz-km @ 850 nm, 500 MHz-km @1300 nm
Fiber Color Code	Blue, orange, green, brown, slate and white
Outer Jacket	Polyethylene black

Fiber Optic Control Modem

Fiber optic control modem (FOCM) must operate asynchronously with a serial TIA-232 compatible interface with Tx data, Rx data, DCD, RTS, CTS, and signal ground interface lines.

Configuration Specifications:

A. The modem is intended for use in a polled multi-drop fiber optic daisy-chained system.
B. There must be two fiber optic interfaces, primary and secondary. DCD must be asserted for a Rx data carrier on either fiber optic interface. Rx data from the primary interface will be placed on the Rx data line of the TIA-232 interface. The presence of DCD must inhibit the generation of CTS in response to RTS, otherwise the modem must generate RTS within 8 ms. When RTS is asserted Tx data will be sent on the primary fiber optic interface. Duplicating TX data to the secondary fiber optic interface must be switch selectable. Rx data on the primary fiber optic interface must retransmitted on the secondary fiber optic interface. Rx data on the secondary fiber optic interface must be retransmitted on the primary fiber optic interface.
C. The modem may have a switch selection to copy Rx data on the secondary fiber optic interface to the TIA-232 interface. The fiber optic transmitters must have a launch power no less than –8 dBm into standard singlemode fiber optic cables.
D. The modem must use ST connectors. The fiber optic operating wavelength must be 1310 nm. The TIA-232 interface must use a standard DB-25 connector.
E. The modem must have a optical power budget of 15 dB with an error rate less than 1 in 10^8.

Weigh Station Bypass (Advance) WIM System Control Cabinet

The weigh station bypass control cabinet shall conform to the requirements in "Transportation Electrical Equipment Specifications," (TEES) and addenda thereto issued by the State of California, Department of Transportation.

The cabinet shall consist of a housing 1A or B, with mounting cage 1, and equipment as shown on the plans in accordance with Chapter 6, "Specifications for Cabinet Models 332, 334 and 336," of the TEES.

The first sentence of Chapter 6, Section 3, Paragraph 6.3.4 of the TEES is amended to read:

> Two steel supporting angles extending from the front to the back rails shall be supplied to support each shelf. The shelves shall be the width of the mounting cage and 18 inches deep. Each shelf shall be attached to the top of two supporting angles with four screws. The front of the shelf shall abut against the front member of the mounting cage.

The police panel specified in Chapter 6, Section 2, Subsection 6.2.6, "Police Panel," of the TEES may be omitted.

The Contractor shall construct control cabinet foundation as shown on Standard Plan ES-3C for Model 334 cabinet (including furnishing and installing anchor bolts), shall install the controller cabinet on said foundation, and shall make all field wiring connections to the terminal blocks in the controller cabinet. The equipment to foundation seam shall be effectively sealed to prevent insect entry.

All exposed surface of the control cabinet shall be lined with high density foam, aluminum clad, insulation to prevent heat gain from the exterior. The insulation shall be attached to the cabinet with adhesive only. The R-value of the insulation shall be greater than R30. The control cabinet shall be equipped with an thermo-electric air conditioning unit. The air conditioning unit shall be sized to maintain the cabinet interior temperature at 90 degree F maximum with ambient temperature of 115 degree F minimum.

Loop Detector

Loop detector sensor units shall be furnished as part of the central unit.

Loop detector shall be Type 2.

Loop detector lead-in cable shall be Type B.

Slot cutting for inductive detector loops shall not be performed until after the concrete pavement has been ground, straightened and brought into tolerance as provided in these special provisions. Loop size and configuration shall be as recommended by the manufacturer of the WIM system.

Temperature of sealant material during installation shall be above70°F. Air temperature during installation shall be above 50°F. Sealant placed in the slots shall be compacted by use of a 8-inch diameter by 1/8-inch thick steel hand roller or other tool approved by the Engineer. Compacted sealant shall be flush with the pavement surface. Minimum conductor coverage shall be one inch. Excess sealant remaining after rolling shall not be reused. On completion of rolling, traffic will be permitted to travel over the sealant.

Slots in Portland cement concrete shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant, or shall be filled with an epoxy sealant conforming to the provisions in Section 95-2.09, "Epoxy Sealant for Inductive Loops," of the Standard Specifications.

Concrete Removal (WIM Scale Frame)

Neither saw cutting nor the removal of concrete for WIM scale frames shall be performed until after the concrete pavement has been ground, straightedged and brought into tolerance as provided in these special provisions.

The outlines of excavations in the pavement for WIM scale frames shall be cut on a neat line to a minimum depth of as recommended by the WIM manufacturer with a power-driven concrete saw before any material is removed. Residue resulting from cutting operations shall not be permitted to flow across shoulders or lanes occupied by public traffic. Residue shall be removed from the pavement surface before any such material flows off said surface, and shall be disposed of in accordance with Section 7-1.13, "Disposal of Materials outside the Highway Right of Way," of the Standard Specifications.

No concrete shall be removed until all saw-cutting for other sensors including loop detector wires has been completed for all lanes in the same direction.

If scale frames and weigh pads are not installed by the end of each working day, such excavations shall be back filled with temporary asphalt concrete to conform to the grade of the adjacent concrete pavement prior to opening lanes to public traffic.

On-site Equipment

The single load cell WIM scales shall provide for single threshold weighing, and operate over a speed range of 5 mph to 100 mph. Single threshold weighing shall consist of 4 scales in each lane of travel. The scales shall cover the entire lane width of 12 ft. The scales shall consist of the minimum following components:

A. Wheel scales, scale lead-in-cables as required, frames and mounting hardware for each lane to be instrumented. The scales shall report weigh data for each wheel track (right axle weight and left axle weight). Such wheel data shall be uniform across any section of the scale. Installation of scales shall conform to the details shown on the plans. A representative of the WIM manufacturer shall be on site during the installation of the WIM scale frames and scales.
B. Two inductive loop detectors per lane for measuring speed and vehicle length. Inductive detector loops and lead-in cable is provided for elsewhere in these special provisions.
C. A central unit shall be installed in the controller cabinet. The central unit shall include all the equipment and software necessary to calculate store and transmit to a host computer all data specified in these special provision. The modem to be installed in the controller cabinet shall be compatible with the host computer modems described under "High Speed WIM System Application Software" elsewhere in these special provisions. The user shall have the capability to enter a site designation code up to three characters.
D. All necessary interconnecting cables and miscellaneous materials required making the system operational.

Any proposed deviations in the equipment specified herein or proposed deviations in the configurations of scales or inductive detector loops shown on the plans shall be submitted to the Engineer. Permission by the Engineer to use alternative equipment and/or configurations shall not relieve the Contractor from meeting the WIM system functional requirements set forth in these special provisions.

Full compensation for any additional costs resulting from deviations or substitutions of equipment shall be considered as included in the contract lumps sum paid for the work involved and no additional compensation will be allowed therefore.

Functional Requirements

1. The WIM scales System shall be able to accommodate vehicles and vehicle combinations with up to nine axles and shall automatically determine for each vehicle:

A. Weight of each axle

Accuracy	MEAN	Standard Deviation
Single Axle	+/- 2.5 percent	6 percent
Tandem Axle	+/- 2.5 percent	4 percent
Gross Weight	+/- 2.5 percent	3 percent

B. Axle Spacing Vehicle length and Speed

Accuracy	MEAN	Standard Deviation
Axle Spacing	+/- 6 "	12 "
Vehicle Length	+/- 12 "	18 "
Gross Weight	+/- 1 mph	2 mph

All accuracy performance testing will be based on 150 truck measurements per lane.

C. Vehicle Classification.

1. The WIM scale system shall provide for a minimum of 15 vehicle classifications. Class 1 through Class 13 shall be used according to Federal Highway Administration's (FHWA) Scheme "F" (as shown in Section 4, Chapter 3 of the FHWA Traffic Monitoring Guide). Class 14 will identify special vehicles as determined by the user. Class 15 will identify any vehicle, which does not conform to the classification criteria for Classes 1 through 14. Classification criteria for Classes 1 through 14 shall be programmable by the user.
2. The WIM scale system shall provide sufficient flexibility in programming parameters including number of axles, axle spacing, and weights (gross, or axle and gross) for each of these classes so that accurate classifying is achievable.

D. Invalid Measurements.

An "invalid measurement" code shall be assigned to any vehicle meeting the front axle weight threshold (discussed below) when (1) the left and right wheel weights of any axle have a difference of 40 percent or more; and (2) either of the wheel weights of such axle exceeds 2.0 kip. Both the 40 percent and 2.0 kip values shall be programmable by the operator. Any vehicle assigned an "invalid measurement" code shall not be considered a "Weighed Vehicle" but shall be classified and counted and all vehicle data shall be stored in the vehicle record.

E. Determination of Weight Violations

For any vehicle meeting the front axle weight threshold (discussed below), the WIM system shall determine which, if any, axle(s) or axle grouping(s) exceed the weight limits set forth in the "Weight Violation Table" contained in these special provisions. Any vehicle with one or more weight violations will be coded as to such a violation or combination of violations. The weight limitations set forth in the "Weight Violation Table" shall be the default settings. Such weights shall be programmable by the user.

2. The central unit of the WIM scale system shall calculate and temporarily store all specified data on a storage medium. The on-site data storage device shall have the capacity to store a minimum of seven days of vehicle count data and individual vehicle records. The storage device shall be completely solid state with no mechanical components and shall be a type that is not susceptible to loss of accumulated data should electrical power be interrupted. The central unit shall continue to calculate and store data for all vehicles passing through the system during periods of access, both on-site by portable PC and remotely by the host computer for purposes of programming, real-time view, and downloading of data.

The central unit shall store the following data:

A. Hourly vehicle counts by class and by speed range for each 24 hour period (Class/Count summary).
B. Individual vehicle records for all vehicles with a front axle weight greater than 3.5 kip (hereafter referred to as "truck records"). The front axle weight threshold for truck records shall be programmable by the operator with 3.5 kip as a default setting. Each truck record shall include, as a minimum, the following data:

i. Time and Date.
ii. Lane Number.
iii. Vehicle number
iv. Speed
v. Vehicle Classification.
vi. Weight in kips of each wheel or dual set of wheels by left and right side and by axle number.
vii. Spacing in feet between each sequentially numbered axle.
viii. Overall length of each vehicle or combination of vehicles in feet.
ix. Code of weight violation(s).
x. Code for invalid weight measurement(s).

3. Data shall be calculated and formatted such that all data can be accessed and all required reports can be generated by use of the high speed WIM system application software.

4. All equipment, with exception of the central unit's modem, shall operate properly within an atmospheric temperature range of -20°F and 122°F.

High Speed WIM System Application Software

An application program, hereafter referred to as the "system program", which can be run on the host computer shall be furnished as part of the high speed WIM system.

The system program shall provide communications between the host computer and the on-site central unit and shall process downloaded data to generate the specified reports and the specified ASCII files. Although referred to herein as a single software program, communications functions and data processing functions may be provided as two separate programs as long as all functional requirements are met. The system program shall be "user friendly," hierarchical menu driven and shall perform the following applications:

1. Communications.

The communications portion of the system program shall include the following applications:

A. Real time view.

The real time view application shall provide for on-line monitoring of traffic. The display on the host computer shall depict the axle configuration of each vehicle passing through the site. The contents and format for the real time display shall be similar to the sample display contained in these special provisions. The user shall have the option of displaying either all traffic or only vehicle classifications 4 through 15 as well as the option of displaying a selected individual lane or all lanes.

Printing of the real time data on the host computer printer shall be facilitated by means of an on/off toggle key from the keyboard.

B. System data programming.

The system data programming application shall provide for on-line modification to the central unit's software parameters, such as speed and weight calibration factors, vehicle classification parameters, weight violation table parameters, and front axle weight threshold.

C. Manual downloading.

The manual downloading application shall provide for the downloading of selected daily data files from the storage medium of the central unit to the storage medium of the host computer. The program shall provide for a listing of the daily data files stored in the central unit and shall provide for user selection of the file or files to be downloaded from such a listing. The program shall provide for the downloading of the current day's data stored as of the time of downloading.

D. Automatic downloading.

The automatic downloading application shall provide for unattended downloading of daily data files stored in the central unit's storage medium to the storage medium of the host computer. The program shall provide the following:

i. User's input for the date and time that unattended downloading is to begin.
ii. Downloading of all daily files not previously downloaded by the automatic downloading application.
iii. At least three attempts to make telephone connection with the central unit.
iv. At least three attempts to download files from the central unit before aborting download.
v. Discontinuation of telephone connection after downloading of files from the central unit (or after an abort) and returning the host computer to a standby mode.

E. History file.

The history file application shall create a daily file which chronologically records events occurring during manual and automatic downloading sessions. Such events shall include, but not be limited to, modem result messages, start and end time of each file download and any pertinent messages generated by the program. The program shall provide for either:

i. The history file shall be in the form of an ASCII text file which can be viewed or sent to the printer or,
ii. A menu selection which shall provide for a listing of available history files and user selection of a file to be sent to the printer in the form of a report.

The communications portion of the system program shall meet the following functional requirements:

A. Host computer's modem configuration:

The program shall initialize the host computer's modem so that all necessary operating characteristics are set.

B. Baud rate

The program will provide for operation at a minimum of 9600 baud.

C. Error control

The program shall not in any way disable the modems' error-checking features which prevent phone-line noise from corrupting data during file downloading.

D. File downloading monitoring

The program shall display a window that allows the user to monitor the progress of file downloading. The program shall also provide for the abort of a file download.

2. Report Preparation.

The report preparation application shall generate specified reports using the downloaded data. Such reports shall be sent to the host computer printer. The program shall prepare the following reports:

A. From vehicle class/count summary file:

i. Distribution of class and speed counts by lane.
ii. Distribution of vehicle counts by hour of day by lane.
iii. Distribution of vehicle classifications by hour of day.
iv. Distribution of vehicle classifications by day of month.
v. Distribution of vehicles by speed by hour of day.

B. From individual truck records file:

i. Distribution of truck record data by lane.
ii. Distribution of weight violations and invalid measurements for vehicle classification 4 through 15.
iii. Distribution of weight violations by hour of day for vehicle classifications 4 through 14.
iv. Distribution of overweight vehicles by hour of day for vehicle classifications 4 through 14.
v. Distribution of gross weights for vehicle classifications 4 through 14.
vi. Distribution of 18 kip equivalent single axle loadings (ESALS) by hour of day for vehicle classifications 4 through 14. Program provides for user input of:

a. pavement type:
(1) Flexible pavement and structural member, or
(2) Rigid pavement and slab thickness.

b. Vehicle status:
(1) "All" weighed vehicles (default), or,
(2) "Legal only" weighed vehicles, or,
(3) "Overweight only" weighed vehicles.

vii. Distribution of trucks by day of month for classifications 4 through 15.

The reports shall include all information contained in and formatted similar to the sample reports contained in these special provisions. The reports shall be printed in condensed print when necessary to fit on 8 1/2" x 11" sheets.

Determination of 18 kip equivalent single axle loads shall be in accordance with the "Axle Load Equivalency Factor" tables contained in these special provisions.

The program shall provide for the generation of reports in the following two modes:

A. Manual mode:

For daily reports the program shall provide for user selection of the date and the specific report. For monthly reports, the program shall provide for user selection of the month/year and the specific report. The selected monthly report shall include the data from all downloaded daily data files resident with the system program on a directory or subdirectory of the host computer's storage medium. The program shall also provide for user selection of the lane or lanes to be covered by the specific report (not applicable to the "Distribution of Class and Speed Counts by Lane", the "Distribution of Vehicle Counts by Hour of Day by Lane" and the "Distribution of Truck Record Data by Lane" reports").

B. Automatic mode:

The program shall provide for user designation of one or a combination of the specific daily reports for automatic processing. User selection of lane or lanes is not required (the "all lanes" default may be used). User selection of vehicle status for the 18 kip ESAL report is not required (the "all" weighed vehicles default may be used). Such designations shall be effected by means of either:

i. An ASCII text file, which can be revised with text editor or word processor, supplied with a "Sample" designation; or,
ii. A menu selection which shall provide for user input of designation.

Upon selection of automatic mode of report preparation by the user, the program shall send to the printer all pre-designated reports for all downloaded daily data files resident with the system program on a directory or subdirectory of the host computer's storage medium.
The designated reports shall remain in effect for subsequent automatic mode sessions unless report designation is revised by the user.

3. Truck Record Batch Print.

The truck record batch print application shall provide for the display of, and on/off printer toggle of, individual truck records. The program shall provide for a listing of the daily truck record files available on the storage medium of the host computer and the user's selection of one of those files. The program shall also provide for the user's selection of the vehicle class or classes for which individual truck records will be displayed or printed as well as the starting hour of day
The user shall have the following options in viewing and printing the individual truck records:

A. Scroll and print continuously all records for the selected class(es); user has capability to stop/resume scrolling or terminate program.
B. Scroll each record one at a time; user has capability to:

i. Print displayed record and display next record.
ii. Display next record.
iii. Terminate program.

Example of the truck record batch print is included in these special provisions.

4. ASCII Export Utility.

The ASCII export utility application shall allow the user to generate specified ASCII files using downloaded files. The user will have the choice of:

A. From vehicle class/count summary file:

i. ASCII classification file
ii. ASCII speed file.

B. From individual truck record file:

i. ASCII truck record file

The file formats for these files are contained in the Information Handout.

5. TMG Files Utility.

The TMG files utility shall allow the user to generate ASCII files conforming to the instructions contained in Section 6 of the FHWA Traffic Monitoring Guide using downloaded files.

Data Files

Notwithstanding the method of data manipulation and formatting used by the central unit, data files shall conform to the following:

1. Individual daily data files shall be created and stored in the storage medium of the central unit. Each daily data file shall include data for each 00:00 hour through a 24:00 hour period and shall have a file name which uniquely identifies the file as to site designation, date, and file contents (i.e. class/count summary data, individual truck record data, or both).
2. The daily data files shall be created at the start of each day, data for each vehicle shall be filed within one hour of the vehicle's passing through the site, and the current day's files shall be accommodative to downloading at any time during the day. Data file structure shall be accommodative to efficient use of storage medium space and rapid downloading via modem to the host computers
3. Daily files containing class/count summary data and individual truck records data may be created in the storage medium of the central unit as two separate daily files or as one daily file. However, if one daily file is created and downloaded as such, the system program shall create two separate daily files, each with a file name which uniquely identifies it as to site, date, and whether it is a vehicle class/count summary file or an individual truck records file.

Acceptance Test

The Contractor shall demonstrate that the high speed WIM system is available for use by the Department of Transportation by successfully completing the acceptance test for each lane of data collection.

The acceptance test shall consist of the following:

1. Continuous operation of the high speed WIM system on-site equipment for 5 consecutive days. Failure of the system to record and store data meeting the requirements set forth in these special provisions for an accumulated time exceeding 3 hours during the 5 days period shall be cause for the acceptance test to be repeated.
2. Testing of the high speed WIM system application software during the above noted 5 days period and the full working day following the 5 days period. Failure of the software to perform any application meeting the requirements set forth in these special provisions shall be cause for the acceptance test to be repeated.

Unavailability shall be the failure of the system to pass the acceptance test. Failure of the host computer or its peripheral equipment or of a communication line not furnished by the Contractor to transmit data may be considered not to render the system unavailable, provided that the Contractor demonstrates to the satisfaction of the Engineer that the failure is not caused by any of the Contractor furnished equipment.

Warranty

The wheel scales, lead-in cables, frames and mounting hardware provided shall include the manufacturer's or supplier's 5 year warranty. All other equipment specified under on-site equipment of these special provisions shall include the manufacturers or suppliers two year warranty.

Such warranty periods shall begin upon completion of the acceptance test of the weigh-in-motion system and shall include all parts and all installation costs, including traffic control if necessary, to make the repairs.

10-3.11 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to Caltrans Maintenance Yard, 13693 Mariposa Road, Victorville, CA 92392, Telephone (760) 241-2321, and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum notice of 2 business days shall be given prior to delivery.

10-3.12 DISPOSING OF ELECTRICAL EQUIPMENT

Fluorescent light ballasts which contain polychlorinated biphenyls (PCBs) shall be disposed of in conformance with the California Department of Toxic Substances Control (DTSC) Regulations set forth in Title 22, Division 4.5, Chapter 42, of the California Code of Regulations.

Ballasts and transformers that contain polychlorinated biphenyl (PCB) are designated as extremely hazardous wastes and fluorescent tubing and mercury lamps are designated as hazardous wastes under Title 22, Division 4.5, Chapter 11, Article 4.1 and Article 5, of the California Code of Regulations.

The State assumes generator responsibility for these wastes. The Engineer will prepare the Hazardous Waste Manifest for Shipment. Ballasts shall be packaged and transported to a hazardous waste disposal facility. The Contractor shall package and transport fluorescent lights to an appropriately permitted facility.

PAYMENT

Full compensation for hauling, stockpiling, and disposing of transformers, fluorescent tubing and mercury lamps and non-leaking fluorescent light ballasts shall be considered as included in the contract price paid for the various items of work and no additional compensation will be allowed therefor.

10-3.13 PAYMENT

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for lighting and sign illumination.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

If any of the fabrication sites for the materials listed are located more than 300 air line miles from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and difficult to determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing these listed materials from each fabrication site located more than 300 air line miles from both Sacramento and Los Angeles will be reduced $2,000:

1. Service equipment enclosures

SECTION 11. (BLANK)

SECTION 12. BUILDING WORK

SECTION 12-1. GENERAL REQUIREMENTS

12-1.01 SCOPE

This work includes the construction of a Joint Port of Entry (JPOE), a Commercial Vehicle Enforcement Facility (CVEF) that includes CVEF Office, Inspection Area, Trash Bin Enclosure, Communication Building, Canopy for pursuit vehicle parking, Canopy for visitor and staff parking, Canopy for Air Resource Board and site furnishings as shown on the plans.

Water wells are not included in the building work. Scope of work for Water Well is specified in Section 10.

Sections 10 through 95 of the Standard Specifications do not apply to the work in Section 12 except when specific reference is made thereto.

12-1.02 ABBREVIATIONS

Abbreviations:

AAMA	American Architectural Manufacturers' Association
ACI	American Concrete Institute
AGA	American Gas Association
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association
APA	Engineered Wood Association
APWA	American Public Works Association
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
BIA	Brick Industry Association
CBC	California Building Code
CEC	California Electrical Code
CMC	California Mechanical Code
CPC	California Plumbing Code
ESO	Electrical Safety Orders
FM	FM Global
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
ICC	International Code Council
ISO	International Organization for Standardization
LEED	Leadership in Energy and Environmental Design
NAAMM	National Association of Architectural Metal Manufacturers
NEC	National Electrical Code
NFPA	National Fire Protection Association or National Forests Products Association
PEI	Porcelain Enamel Institute
RIS	Redwood Inspection Service
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
TCNA	Tile Council of North America
TPI	Truss Plate Institute
WCLIB	West Coast Lumber Inspection Bureau (stamped WCLB)
WCLB	Grade stamp for WCLIB
WI	Woodwork Institute
WWPA	Western Wood Products' Association

12-1.03 COOPERATION

Comply with all security policies of the State facility.

Submit requests for approval to the Engineer before interrupting any services for the purpose of making or breaking a connection. Include in the request the proposed time period necessary to complete the work. Allow the Engineer 5 days to review each request.

Do not use State telephone facilities.

12-1.04 SUBMITTALS

Items to be submitted to the Engineer must be approved under Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications.

Items to be furnished to the Engineer do not require approval.

The Engineer may request submittals for materials or products where submittals have not been specified in these special provisions, or may request that you include additional information in specified submittals, as necessary to determine the quality or acceptability of such materials or products.

Submit the following items within 50 days of contract approval:

1. Working drawings
2. Material lists
3. Product and descriptive data
4. Samples
5. Other submittals

Submit at least 5 sets of each item. Two sets will be returned either approved for use or returned for correction and resubmittal.

Submit the Schedule of Values within 20 days of contract approval. Submit at least 2 sets.

Each item submitted must include a descriptive title, the name of the project, district, county, contract number, and must reference the applicable portion of the contract documents that it pertains to. Plans and detailed drawings must be not larger than 24" x 36."

The material lists must include the name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols used on the plans and in these special provisions for each unit.

Deliver submittals to Offices of Structure Design, Documents Unit.

Allow 20 days for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete the review within the time specified and Engineer determines that your controlling operation is delayed or interfered with by delay in review, an extension of time commensurate with the delay in completion of the your work will be granted under Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Remove unapproved samples and samples not incorporated in the work from State property.

Furnish 3 copies of the following items to the Engineer at the job site:

1. Parts lists and service instructions packaged with or accompanying the equipment
2. Operating and maintenance instructions
3. Manufacturer's warranties
4. Qualification data

12-1.05 SCHEDULE OF VALUES

Divide the Schedule of Values into sections representing the cost of each separate building or structure. Do not include work that is not part of the building or structure in the building or structure cost. Include this work under a specific section as General Work.

List indirect costs and bond premiums as separate line items of work.

Identify the sections representing each building or structure as to the building or structure they represent and break them down to show the corresponding value of each craft, trade or other significant portion of the work. Provide a sub-total for each section.

The Schedule of Values must be approved by the Engineer before any partial payment estimate is prepared.

The sum of the items listed in the Schedule of Values must equal the contract lump sum price for building work. Do not list overhead and profit. Include bond premiums and other such items in the mobilization bid item for the entire project.

12-1.06 INSPECTION

Any work that will be covered or not visible in the completed work must be inspected and approved by the Engineer before progress of work conceals portions to be inspected. Notify the Engineer not less than 72 hours in advance of when such inspections are needed.

Provide adequate temporary lighting to allow the Engineer to inspect the project as each portion is completed.

12-1.07 UTILITY CONNECTION

Make all arrangements and obtain all permits and licenses required for the extension of and connection to each utility service applicable to this project. For extensions not performed or provided by the utility, provide all labor and materials necessary for such extensions and install any intermediate equipment required by the serving utilities.

The costs incurred by you for (1) utility permits, licenses, connection charges, and excess length charges, (2) the extensions of utilities beyond the limits shown on the plans, and (3) furnishing and installing any intermediate equipment required by the serving utilities, will be paid for as extra work under Section 4-1.03D of the Standard Specifications.

12-1.08 SANITARY FACILITIES

Do not clean tools or dispose of cleaning liquids in State sanitary facilities or sewers.

During toilet room renovation or other periods when State sanitary facilities are not operational, provide the following for State forces:

1. Wash facilities
2. Drinking water fixtures
3. At least two temporary toilet units

Provide separate temporary toilet units for your personnel.

Temporary toilet units must be 1) single occupant units of the chemical type, 2) properly vented, and 3) fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

Perform periodic flushing, waste removal, and cleaning of temporary toilet units. Maintain units in a clean and sanitary condition, including a supply of toilet tissue, toilet seat covers, and paper towels. Dispose of waste material off site in a lawful manner.

12-1.09 MEASUREMENT AND PAYMENT

The contract lump sum price paid for building work includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in performing the building work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for any incidental materials and labor, not shown on the plans or specified that are necessary to complete the building work, are considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

All water well work will be measured and paid for as specified in "Water Well" in Section 10 of these special provisions.

12-1.10 PROJECT RECORD DRAWINGS

Prepare and maintain one set of project record drawings, using an unaltered set of original project plans, to clearly show all as-constructed information for the project.

As a minimum, project record drawings must include the following information:

1. Any plan clarifications or change orders
2. Locations of any underground utilities
3. Location, size, type, and manufacturer of all major products or components used in the work.

Prepare project record drawings as follows:

1. Place markings on the project record drawings using red ink or red pencil.
2. Do not eradicate or write over original figures.
3. Neatly line out superseded material.
4. Submit additional drawings if the required information cannot be clearly shown on the original set of project plans. The additional drawings must be not less than 11" x 17" in size. Label each sheet with the contract number.
5. Sign and date each sheet verifying that all as-built information shown on the drawings is correct.

Review the project record drawings monthly with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.

Before completion of the work, request a review of the project record drawings to determine the completeness and adequacy of them. If the project record drawings are unacceptable, you must inspect, measure, and survey the project as necessary to record the required additional information.

Deliver the completed project record drawings to the Engineer before acceptance of the contract.

12-1.11 FIELD ENGINEERING

This section specifies administrative and procedural requirements for field engineering services to be performed by the Contractor.

Lines and Grades:

Attention is directed to Section 5-1.07, "Lines and Grades," of the Standard Specifications.

Such stakes or marks will be set by the Engineer as he determines to be necessary to establish the lines and grades required for the completion of the work shown on the plans and as specified in these special provisions. In general, these will consist of the primary vertical and horizontal control points.

Stakes and marks set by the Engineer shall be carefully preserved by the Contractor. In case such stakes and marks are destroyed or damaged they will be replaced at the Engineer's earliest convenience. The Contractor will be charged for the cost of necessary replacement or restoration of such stakes and marks which in the judgment of the Engineer were carelessly or willfully destroyed or damaged by the Contractor's operations. This charge will be deducted from any moneys due or to become due the Contractor.

All other stakes or marks required to establish the lines and grades required for the completion of the work shall be the responsibility of the Contractor.

Existing utilities and equipment:

The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, the Contractor shall investigate and verify the existence and location of underground utilities and other construction.

Prior to construction, the Contractor shall verify the location and invert elevation at points of connection of sanitary and septic sewers, storm sewer, and water or fire service piping.

Surveys for layout and performance:

The Contractor shall perform all surveys for layout and performance, reduce field notes, and make all necessary calculations and drawings necessary to carry out the work.

The Contractor shall locate and layout site improvements, and other work requiring field engineering services, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

Batter boards shall be located and laid out for structures, building foundations, column grids and locations, floor levels and, control lines and levels required for mechanical and electrical work.

Survey accuracy and tolerances:

The tolerances generally applicable in setting survey stakes for foundations, slabs, and underground work shall not exceed the following:

Survey Stakes or Markers	Tolerance
Rough grading or excavation	0.10-foot
Trimming or preparation of subgrade for roadways	0.05-foot
Roadway surfacing, steel or concrete pipe	0.02-foot
Structures or building construction	0.01-foot

Such tolerance shall not supersede stricter tolerances required by the plans or special provisions, and shall not otherwise relieve the Contractor of responsibility for measurements in compliance therein.

SECTION 12-2. SITEWORK

12-2.01 EARTHWORK FOR BUILDING WORK

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of performing earthwork for building work in accordance with the details shown on the plans and these special provisions.

Earthwork for building work shall consist of structure excavation and structure backfill. Structure excavation shall include excavation for footings, foundations, walls, slabs, tanks, drywells, manholes, oil/water separators, clarifiers, and trenches. Structure backfill shall include backfilling under slabs; backfilling under and around footings; backfilling for walls, backfilling for pipes and conduits; backfilling holes resulting from removal of existing facilities. In addition to structure excavation and structure backfill, earthwork for building work shall include any other earthwork, not mentioned, but necessary to complete the building work.

Attention is directed to the Materials Information Handout for information regarding foundation recommendations and reports that were prepared for use during the design of this project.

Attention is directed to the requirements of "Field Engineering" in Section 12-1, "General Requirements," of these special provisions.

Related Work: Leach lines shall be excavated and backfilled in accordance with the requirements specified under "Septic Sewage Disposal System" elsewhere in this Section 12-2.

QUALITY ASSURANCE

Samples: Samples of sand, pea gravel, or crushed stone, weighing not less than 25 pounds, shall be submitted to the Engineer at the jobsite for approval.

SITE CONDITIONS

Existing Underground Piping and Conduit: The location of existing underground piping and conduit is based on the best records available. Before beginning work, the Contractor shall accurately locate the piping and conduit involved in the work. If the location of the existing piping or conduit deviates from the location shown on the plans by more than 5 feet, or, if no elevations are indicated and the piping or conduit is more than 3 feet below grade, the cost of the additional excavation, backfill, piping or conduit, and removal and replacement of concrete, if any, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Existing Surfaced or Planted Areas:

Existing surfaced or planted areas that are removed, broken or damaged by the Contractor's operations shall be restored to their original condition except as otherwise shown on the plans or specified herein.

Restoration materials shall be equal to or better than the original materials. Surfacing shall be replaced to match the material thickness, grades, and finish of the adjacent surrounding surfaces.

PART 2 - PRODUCTS

BACKFILL MATERIALS

Structure Backfill: Structure and trench backfill shall be free of organic and other deleterious material and shall be suitable for the required compaction. Gravel without sand matrix shall not be used except as free draining granular material beneath slabs and footings.

Select Backfill: Select backfill shall conform to the requirements specified under "Aggregate Base," elsewhere in this Section 12-2.

Sand: Sand shall be clean, washed sand, free from clay or organic material graded such that 100 percent passes the ¼-inch sieve, 90 percent to 100 percent passes the No. 4 sieve and not more than 5 percent passes the No. 200 sieve size.

Pea Gravel (Naturally Rounded):

Pea gravel (naturally rounded) shall be clean, washed, dry density of not less than 95 pounds per cubic foot, free from clay or organic material and shall conform to the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
¾"	100
½"	90-100
3/8"	40-70
No. 4	0-15
No. 8	0-3

Pea gravel shall conform to the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

Crushed Stone:

Crushed stone shall be clean, washed, dry density of not less than 95 pounds per cubic foot, crushed stone or crushed gravel with an angular particle size not less than 1/8 inch or more than ½ inch.

Sieve or Screen Size	Percentage Passing
½"	100
3/8"	85-100
No. 4	10-30
No. 8	0-3

Crushed stone shall conform to the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

PART 3 - EXECUTION

PREPARATION AND RESTORATION

Sawcutting: Prior to excavation or trenching, existing surfacing shall be removed to saw cut lines, or to existing wood dividers or expansion joints, if any. The saw cut shall be to a neat line and have a depth not less than one inch.

Restoration: Surfacing shall be replaced to match the thickness, grades and finish of the adjacent surrounding surfaces.

STRUCTURE EXCAVATION

Unless otherwise noted, all excavation for building work shall be classified as structure excavation.

Footing Excavation:

Where footings are placed on the fill material, over-excavate 3 feet below the bottom of the footings. Where footings are placed in cut section of less than 3 feet deep, over-excavate to a full depth of three feet. The over-excavated area shall be backfilled to the bottom of the footing grade with new fill or native material and large rocks and compacted to 95% relative compaction.

Wherever over-excavation is not required, the bottom of excavation shall not be disturbed. The contractor shall excavate by hand to the final grade. The bottom of concrete footings shall be poured against undisturbed material. Unless otherwise noted, compaction of the bottom of footing excavation is not required unless the material is disturbed. The footing depths shown on the plans shall be changed to suit field conditions when directed by the Engineer. Solid rock at or near required depths shall not be disturbed.

Unsuitable material shall be excavated down to firm bearing as directed by the Engineer. Work and materials required because of excavation in excess of the depths shown on the plans, when such excavation has been ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Excavate to the elevations and dimensions within a tolerance of ±1/2 inch. Limits of the excavation shall allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation shall be replaced in kind and compacted at the Contractor's expense.

Overdepth excavation for footings shall be backfilled with concrete or such other material recommended by the Contractor and approved by the Engineer. Relative compaction shall be not less than 95 percent.

At locations and to the limits shown on the plans, material below the bottom of the foundation or footing shall be removed and replaced with select backfill in accordance with the placing and compacting requirements for backfill.

Excavation for Pipes and Conduits:

Pipes or conduits in the same trench shall have a minimum clear distance between pipes or conduits of 6 inches. Pipes or conduits shall have not less than 2½ feet of cover from top of pipes or conduits to finished grade unless otherwise shown on the plans or specified.

Trenching shall be of sufficient depth to permit placing a minimum depth of 4 inches of compacted sand under all pipes and conduits.

Excavation adjacent to trees shall be performed by hand methods where necessary to avoid injury to trees and roots. Roots 2 inches in diameter and larger shall be protected with heavy burlap. Roots smaller than 2 inches in diameter adjacent to trees shall be hand trimmed. Cuts through roots ½ inch in diameter and larger shall be sealed with tree trimmers' asphaltic emulsion. If trenches remain open more than 24 hours, the side of the trench adjacent to the tree shall be shaded with burlap and kept damp. Materials shall not be stockpiled within the drip line of trees.

Dewatering: Excavations shall be kept clear of standing water. Water shall be removed by pumping if necessary. Water removed from excavation shall be carried away from the building site and disposed of in a manner that will not harm State or adjacent property.

STRUCTURE BACKFILLING

Unless otherwise noted, all backfill for building work shall be classified as structure backfill. Backfill shall be placed and compacted in horizontal layers, not more than 6 inches thick prior to compaction, and to the lines and grades shown on the plans or to original ground.

Structure Backfill: After structures are in place and forms are removed, wood and other debris shall be removed from excavations before placing structure backfill.

Backfilling Pipes and Conduits:

Backfill placed under pipe and conduits shall be compacted sand, 4 inches minimum depth. Backfill material placed to a level 6 inches above tops of pipes and conduits shall be sand or fine earth and particles shall not exceed ½ inch in greatest dimension. For wrapped, coated, or plastic pipe or conduits, sand shall be used for backfill. Backfill material placed higher than 6 inches above tops of pipes or conduits shall consist of material free of stones or lumps exceeding 4 inches in greatest dimension except:

1. The top 12 inches of backfill under roads, walks or paving shall consist of aggregate base material.
2. The top 6 inches of backfill in planted areas shall consist of topsoil.

Unless otherwise shown on the plans, pipe under roads, with less than 2½ feet of cover over the top of pipe, shall be backfilled with concrete to a level 4 inches above the top of pipe. Concrete for backfill shall be commercial quality concrete containing not less than 564 pounds of cement per cubic yard.

COMPACTION

Relative compaction shall be determined in accordance with California Test 216 or 231.

Unless otherwise noted below, all backfill shall be compacted to a minimum relative compaction of 90 percent.

Unless approved in writing by the Engineer, compaction by jetting or ponding will not be permitted.

Compact Original Ground: Original ground surface under fill with surfacing of concrete and asphalt concrete shall be compacted to a relative compaction of not less than 95 percent for a minimum depth of 6 inches.

Subgrade Preparation:

Preparation of subgrade material for placing aggregate base, surfacing, or slabs thereon shall include fine grading, compaction, reworking as necessary. The upper 6 inches of the subgrade shall have the same compaction as the fill to be placed over it.

The prism of backfill directly underneath the building foundation and sloping downward at 1:1 shall be compacted to 95 percent.

Structure Backfill: Structure backfill shall be compacted to not less than 95 percent relative compaction.

Select Backfill:

Select backfill shall be compacted to not less than 95 percent relative compaction.

A relative compaction of not less than 95 percent shall be obtained for a minimum depth of 6 inches below the bottom of the excavation before placing select backfill.

Trench Backfill: Trench backfill placed beneath slabs or paved areas shall be compacted to a relative compaction of not less than 95 percent.

DISPOSAL

Surplus Material: Surplus material from the excavation shall be removed and disposed of outside the right-of-way in accordance with Section 7-1.13 of the Standard Specifications.

FIELD QUALITY CONTROL

Inspection: When the excavation is substantially completed to grade, the Contractor shall notify the Engineer. No concrete shall be placed until the foundation has been approved by the Engineer.

Testing: The State will conduct compaction tests during the backfilling and compacting operations.

12-2.02 AGGREGATE BASE

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing, spreading and compacting aggregate base in accordance with the details shown on the plans and these special provisions.

PART 2 - PRODUCTS

Aggregate base:

Aggregate base shall be commercial quality aggregates consisting of broken stone; crushed gravel; natural, clean, rough-surfaced gravel and sand; or a combination thereof.

Aggregate base shall conform to the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
1”	100
¾”	90 - 100
No. 4	35 - 60
No. 30	10 - 30
No. 200	2 - 9

Aggregate base shall also conform to the following quality requirements:

Tests	California Test No.	Test Requirements
Durability Index	229	35 Min.
Resistance (R-Value)	301	78 Min.
Sand Equivalent	217	22 Min.

PART 3 - EXECUTION

SPREADING AND COMPACTING

Spreading:

Aggregate base shall be placed and compacted to the lines and grades shown on the plans.

Spreading and compacting shall be performed by methods that will produce a uniform base, free from pockets of coarse or fine material.

Compaction: Relative compaction of each layer of compacted base material shall be not less than 95 percent, as determined by California Test 216 or 231.

12-2.03 FREE DRAINING GRANULAR MATERIAL

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and placing free draining granular material beneath slabs in accordance with the details shown on the plans and these special provisions.

PART 2 - PRODUCTS

Free Draining Granular Material: Free draining granular material shall be clean, hard, durable, free-draining rock. The material gradation shall be such that all passes the one-inch screen, and not more than 10 percent

passes the No. 4 sieve as determined by California Test 202. Granular material shall be free from organic material, clay balls or other deleterious substances.

PART 3 - EXECUTION

SPREADING AND CONSOLIDATING

Free draining granular material shall be placed, spread, and consolidated by tamping or vibrating.

12-2.04 CAST-IN-DRILLED-HOLE CONCRETE PILES

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of constructing cast-in-drilled-hole concrete piles in accordance with the details shown on the plans and these special provisions.

PART 2 - PRODUCTS

Concrete and Reinforcement: Concrete and reinforcement shall conform to the requirements specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

PART 3 - EXECUTION

CONSTRUCTION

Drilling Holes:

All holes for concrete piles shall be drilled to the tip elevations or depths shown on the plans. All holes shall be examined for straightness and any hole which on visual inspection from the top shows less than 1/2 the diameter of the hole at the bottom of the hole shall be rejected. Suitable casings shall be furnished and placed when required to prevent caving of the hole.

All loose material existing at the bottom of the hole after drilling operations have been completed shall be removed before placing concrete in the hole.

Material resulting from drilling holes shall be wasted on the job site as directed by the Engineer.

Surface water shall not be permitted to enter the hole and all water which may have infiltrated into the hole shall be removed before placing concrete therein.

Placing Reinforcement:

The reinforcing cage shall be placed and secured symmetrically about the center of the pile and shall be securely blocked to clear the sides of the hole.

Longitudinal reinforcing steel shall be continuous for the entire length of pile, including pile extensions.

Placing Concrete:

The concrete filling shall be vibrated to a dense and homogeneous condition. Concrete placed in drilled holes shall be placed against undisturbed material except when portions of the pile will be exposed to view. Surfaces exposed to view and adjacent surfaces within 10 inches of finished grade shall be formed.

Casing, if used in drilling operations, shall be removed from the hole as concrete is placed therein. The bottom of the casing shall be maintained not more than 5 feet nor less than one foot below the top of the

concrete during withdrawal and placing operations, unless otherwise permitted by the Engineer. Separation of the concrete during withdrawal operations shall be avoided by hammering or otherwise vibrating the casing.

Formed surfaces shall conform to the requirements specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

12-2.05 WATER SUPPLY SYSTEM

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a complete water supply system in accordance with the details shown on the plans and these special provisions.

The water supply system shall include all equipment, accessories and appurtenances necessary for the complete installation and operation of the system.

Earthwork, foundations, supports, sheet metal, painting, mechanical, electrical, and all other work incidental to and necessary for the proper installation and operation of the water supply system shall conform to the requirements for similar work elsewhere in these special provisions.

Regulations: The work shall be performed in accordance with all applicable portions of the: California Code of Regulations (CCR): Title 17, Title 22, and Title 24; California Plumbing Code, County laws, ordinances, and regulations. In the event of any conflict with the provisions herein, the applicable laws, ordinances, or regulations shall prevail.

Related Work: Water treatment shall be as specified in "Reverse Osmosis Filtration System and Salt-Free Water Softener," in Section 12-11, "Equipment," of these special provisions. Piping valves and fittings for buildings shall be as specified in "Pipe, Valves and Fittings," in Section 12-15, "Mechanical," of these special provisions.

SUBMITTALS

Working drawings, material lists, descriptive data, and other submittals specified herein shall be submitted for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and these special provisions.

Unless otherwise permitted in writing by the Engineer, all submittals required by these special provisions shall be submitted within 35 days after the Contractor has received notice that the contract has been approved.

Attention is directed to the provisions in Section 5-1.01, "Authority of Engineer," of the Standard Specifications. The Engineer may request submittals for materials or products where submittals have not been specified in these special provisions, or may request that additional information be included in specified submittals, as necessary to determine the quality or acceptability of such materials or products.

Attention is directed to Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The second indented paragraph of the first paragraph of said Section 6-1.05 is amended to read:

> Whenever the specifications permit the substitution of a similar or equivalent material or article, no tests or action relating to the approval of such substitute material will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request shall be made within a time period not to exceed 35 days after the date on which the contract has been approved, shall be made in ample time to permit approval without delaying the work, but need not be made in less than 35 days after award of the contract.

Work requiring the submittal of working drawings, material lists, descriptive data, or other submittals shall not begin prior to approval of said submittal by the Engineer. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

Submittals shall be delivered to the locations indicated in these special provisions. If a specific location is not indicated, the submittal shall be delivered to the Division of Structure Design, Documents Unit, Fourth Floor, Mail Station 9-4/4I, 1801 30th Street, Sacramento, California 95816, telephone (916) 227-8252, or the submittals shall be mailed to the Division of Structure Design, Documents Unit, Mail Station 9, P. O. Box 942874, Sacramento, California 94274-0001.

Each submission of drawings, material lists and descriptive data shall consist of at least 5 copies. Two copies will be returned to the Contractor either approved for use or returned for correction and resubmittal.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall not be larger than 22" x 36".

Working drawings shall show complete layout and details of the pump, equipment and materials to be installed.

The material list and descriptive data shall be complete as to name of manufacturer, catalog number, size, capacity, finish, all pertinent performance ratings, and identification symbols used on the plans and in the special provisions for each unit.

The material list and descriptive data submittals shall include, but not necessarily be limited to, the following:

Well Pump
Water Level Indicator System
Screened Casing Vent
Sanitary Well Seal
Booster Pump (Irrigation)
Booster Pump (Water Treatment Room)
Flexible Coupling
Storage Tank
Water Level Gage
Surge Tank
Pressure Tank
Air Volume Control System
Sight Gage and Enclosure
Pressure Gage
Gage Cock
Sampling Valve
Check Valve
Hose Faucet (no threading)
Safety Relief Valve
Y-Strainer
Pressure Switch
Float Switch
Backflow Preventer Assembly (reduced pressure principle)
Ball Valve
Water Meter
Heat Tape
Chemical Feed Equipment

Parts lists and service instructions packaged with or accompanying the equipment installed in the work and the performance characteristic curve for the pump shall be delivered to the Engineer at the jobsite.

Closeout documents shall be furnished for the following equipment prior to completion of the project:

1. Well Pump
2. Water Level Indicator System
3. Booster Pump (Irrigation)
4. Booster Pump (Water Treatment Room)
5. Water Level Gage
6. Air Volume Control System
7. Flow Sensor Switch
8. Pressure Switch
9. Float Switch
10. Chemical Feed Equipment

Each closeout document shall contain the following information:

1. Parts list.
2. Operating instructions.
3. Maintenance instructions.
4. Wiring schematics.

Three copies of each closeout document shall be submitted in the following medium:

1. One copy on CD (computer disk), file(s) shall be in portable document format (PDF)
2. Two copies in individual 3-ring binders containing hard paper copies

Manufacturer's warranties and guarantees for equipment and materials installed in the work shall be delivered to the Engineer at the jobsite.

MAINTENANCE INSTRUCTIONS

Before completion of the project, one set of maintenance instructions for the pump and other equipment shall be framed, mounted and securely fastened to the wall of the well enclosure (for the irrigation booster pumps and the well pump) and wall of the treatment room (for the booster pumps for the water treatment system), at a convenient location approved by the Engineer.

PART 2 - PRODUCTS

Domestic Water Well Pump: California Vehicle Enforcement Facility (CVEF):

The well pump shall be the submersible turbine deep well type. The pump column and discharge pipe shall be 3-inch diameter Schedule 40, galvanized steel pipe conforming to the requirements of ASTM Designation: A 53.

The pump bowls, suction bell and discharge case shall be stainless steel. The pump diffusers shall be stainless steel. The pump bowl assembly shall have an outside diameter not greater than 5.67 inches.

The pump screens shall be stainless steel or non-magnetic material and shall have a diameter no larger than the suction bell. All bolts, studs, and nuts used on the pump bowl assembly shall be nonmagnetic stainless steel.

The impellers shall be stainless steel, enclosed type, and shall be dynamically balanced. The bowl bearings shall be silicon carbide, bronze or combination bronze and rubber. The impeller shaft shall be stainless steel.

The pump shall be capable of pumping water, under test, at the flow rates and the total heads shown on the plans. The pump shall not load the motor beyond the nameplate rating multiplied by the service factor at any point on the pump curve.

The motor shall be a solid shaft, induction motor, and shall be designed for continuous duty underwater operation. Horsepower rating, voltage, phase, and RPM shall be as shown on the plans.

Submersible Cable: Domestic Water Well CVEF:

The submersible cable shall consist of 3 No. 8 AWG copper conductors with ground in a single jacketed, 4-conductor cable assembly. Each conductor shall be insulated with synthetic rubber or plastic suitable for continuous immersion in water. When a multiple conductor cable is used the cable shall be jacketed. The jacket material shall be oil and water resistant synthetic rubber or other suitable mechanically protective material.

The cable shall be supported from the column with nylon straps at 10-foot intervals. All cable fittings and terminals shall be watertight for the water pressure encountered.

The conductors shall be protected by a stainless steel guard where they pass the pump bowls.

The cable shall be continuous without splices between the starter and the deep well pump motor.

Water Level Indicator System: A water level indicating system shall be installed as shown on the plans. The system shall consist of air line, hand air pump, altitude gage and all necessary fittings. The altitude gage shall be calibrated in feet of water and adjustable for various lengths of air line. The air line shall be 1/4-inch diameter, hard plastic tubing with a bend radius of approximately 3 inches and a pressure rating of at least 200 psi. The air line shall extend to the bottom of the bowl assembly and shall be secured to the discharge pipe with nylon straps at 10-foot intervals.

Sanitary Well Seal: The sanitary well seal shall be a standard commercially manufactured product that seals against the entrance of surface water when the cap screws are tightened to force a rubber packer against the well casing and the discharge pipe. The unit shall be factory painted cast iron with a two piece design for removal or installation without removing the well pump or column. The seal shall have tapped openings for conduit and vent connections. The sanitary well seal shall be installed in accordance with the manufacturer's recommendations.

Screened Casing Vent: Screened casing vent shall be ¾ inch with dual outlets facing downward, cast iron body and stainless steel or brass screen.

Booster Pump: CVEF:

Booster pump shall be a close-coupled, bronze fitted, single-stage horizontal centrifugal pump with mechanical seal and ball or roller bearings. Pump case shall be close-grained, high strength cast iron with bronze wear ring. Pump shaft shall be stainless steel. Impeller shall be bronze and certified dynamically balanced.

Booster pump shall be capable of pumping water, under test, at the flow rates and the total heads shown on the plans. The pump, as installed, shall not load the motor beyond the nameplate rating.

The maximum net positive suction head (NPSH) for the pump shall not exceed 107 feet at 25 gallons per minute flow rate.

The pump motor shall be a weather protected Type 1 totally enclosed fan cooled motor. Three-phase motor shall be NEMA Design B induction motor. Horsepower rating, voltage, phase and RPM shall be as shown on the plans.

Booster Pump: CVEF (Water Treatment Room):

Booster pump shall be a close-coupled, bronze fitted, 5-stage horizontal centrifugal pump with mechanical seal and ball or roller bearings. Pump case shall be close-grained, high strength cast iron with bronze wear ring. Pump shaft shall be stainless steel. Impeller shall be bronze and certified dynamically balanced.

Booster pump shall be capable of pumping water, under test, at the flow rates and the total heads shown on the plans. The pump, as installed, shall not load the motor beyond the nameplate rating.

The maximum net positive suction head (NPSH) for the pump shall not exceed 139 feet at 25 gallons per minute flow rate.

The pump motor shall be a Type 1 totally enclosed fan cooled motor. Single-phase motor shall be capacitor type. Horsepower, voltage, phase and RPM shall be as shown on the plans.

Water Supply System to Water Treatment Room

Piping: Pipe, joints and fittings shall be furnished and installed in accordance with the requirements specified in Section 20-2.15, "Pipe," of the Standard Specifications.

Water Treatment Room

Piping: Pipe, joints and fittings shall be furnished and installed in accordance with the requirements specified under "Pipe, Fittings and Valves" in Section 12-15, "Mechanical," of these special provisions.

Flexible Coupling: Flexible couplings shall be gasketed short sleeve type couplings consisting of a mild steel middle ring with pipe stop, 2 rubber compound wedge-section ring gaskets, 2 mild steel follower rings and sufficient mild steel bolts to compress the gaskets. All ferrous metal parts of the coupling shall be hot-dip galvanized after fabrication.

Flexible Connector: Flexible coupling shall be bronze or stainless steel hose with wire braid exterior reinforcing. Couplings shall be rated for 125 psi minimum and shall have threaded or flanged ends.

Storage Tank:

Storage tank shall be an above ground verticle, ultra violet stabilized black plastic tank. Tank dimensions on the plans are nominal and may be varied a maximum of 6 inches in diameter or height provided the tank capacity shown on the plans is maintained. The tank shall include fittings, access opening and screened vent. The access hatch shall be equiped with latches to secure with a state provided padlock. Openings in the tanks shall accommodate the piping as shown on the plans. Tank shall be in accordance with CCR, Title 22 and FDA approved for potable water use.

The screened tank vent shall have an open area equal to a nominal 5-inch diameter pipe. Screened vent "pipe" shall have dual outlets facing downward, PVC with stainless steel or brass screens.

Water Level Gage: The water level gage for the storage tank shall be the hydrostatic type calibrated in gallons and shall include a built-in hand-pump, air line, and all fittings necessary for complete and successful operation. Gauge face diameter shall be at least 12 inches.

Surge Tank: Surge tank shall be a pressurized, bladder type, hydropneumatic tank. The tank shall be free standing, rated at 125 psi working pressure, constructed of heavy gage steel, glass-lined, with a bladder diaphragm. The tank shall be equipped with a pressure gage, gage cock, and a replaceable air charging valve. Bladder diaphragm shall be a heavy gage material which does not impart taste or odor, will not absorb water, and meets FDA requirements for potable water usage. The tank capacity shall be as shown on the plans. The exterior surfaces of the tank shall be prepared and painted in accordance with the requirements specified for steel and other ferrous metals under "Painting" in Section 12-9 "Finishes," of these special provisions.

Pressure Tank:

Pressure tank at domestic water well shall be a horizontal, epoxy lined steel pressure vessel conforming to the ASME Code for unfired pressure vessels. The wall thickness of the tank shall be increased 1/16 inch above nominal design to account for corrosion. The tank shall have a working pressure of 125 psi and shall be stamped accordingly. The tank shall have an 11" x 15" oval manhole at one end, lifting lugs, support

saddles, and extra-heavy half couplings welded to the tank. Openings in the tank shall accommodate the piping as shown on the plans. Capacity shall be as shown on the plans.

Pressure tank in water treatment room shall be a verticle, epoxy lined steel pressure vessel conforming to the ASME Code for unfired pressure vessels. The tank shall have a working pressure of 125 psi and shall be stamped accordingly. The tank shall have an 12" x 16" oval manhole at one end, lifting lugs, support saddles or angle legs, and extra-heavy half couplings welded to the tank. Openings in the tank shall accommodate the piping as shown on the plans. Capacity shall be as shown on the plans.

Epoxy lining of the tank shall conform to the requirements of latest edition of AWWA Standard D102, "Painting Steel Water-Storage Tanks," Section 3.2, "Inside Paint System No. 1". Paint systems containing coal tar, trichloroethylene or tetrachloroethylene (perchloroethylene) shall not be used.

The exterior surfaces of the tank shall be prepared and painted in accordance with the requirements specified for structural steel in Section 59, "Painting," of the Standard Specifications.

The exterior surfaces of the tank shall be prepared and painted in accordance with the requirements specified for steel and other ferrous metals under "Painting" in Section 12-9 "Finishes," of these special provisions.

Air Volume Control System: The air volume control system for the pressure tank shall be a completely self-contained unit including an oilless piston type air compressor, encapsulated solid-state controls, safety valve, pressure switch, and adjustable electrode with a weatherproof cover. The unit shall be rated to operate at tank pressures up to 110 psi. The air compressor motor shall have thermal overload protection.

Sight Gage:

Sight gage shall be bronze, water-gage valve type, automatic, minimum 5/8-inch diameter glass tube sized for 36-inch centers, 200 psi rated, and with ½-inch pipe thread connection.

Sight gage enclosure shall be fabricated of 14-gage galvanized steel completely enclosing the sight gage and shall contain rigid polystyrene foam plastic insulation inside. The enclosure shall have a hinged cover and latch that maintain the door in the closed position when not in use.

Pressure Gage: Pressure gage shall be ANSI standard: B40.1, Grade A, 4 1/2-inch dial, liquid filled with cover, plain case, reset screw, and bottom inlet. Gage shall read from 0 psig to 125 psig. Each pressure gage shall be equipped with a gage cock.

Gage Cock: Gage cock shall be ¼ inch, brass or bronze, and rated for 150 psi.

Backflow Prevention Assembly: Backflow preventer shall be a reduced pressure principle (RPP) backflow preventer. Backflow preventer shall contain two independent check valves with an intermediate relief valve, two shut-off valves, and four ball type test cocks. Backflow preventer shall conform to the requirements of AWWA Standard C511-97.

Valves: Valves shall be in accordance with the requirements specified under "Pipe, Fittings and Valves" in Section 12-15, "Mechanical," of these special provisions.

Check Valve (1½-inch and smaller): Check valve (1½-inch and smaller) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be Nibco/Scott, T-480; CPV, 36; Kitz, 26; or equal.

Check Valve (2-inch and larger): Check valve (2-inch and larger) shall be silent wafer type, full faced for installation between 125 psi flanges, iron body with bronze trim, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be APCO, Series 300; CPV, 10D; Metraflex, Series 900; or equal.

Sample Valve: Sampling valve shall be 1/8 inch or ¼ inch brass or bronze, rated at 100 psi minimum, with lever handle and bib nose outlet without threads.

Safety Relief Valve: Safety valve shall be rated for a working pressure of 200 psi, set at 125 psi and equipped with a manual test lever. The size shall be as shown on the plans.

Y-Strainer: Strainer shall be wye pattern, cast iron body with a Type 304 stainless steel or monel strainer screen. The strainer screen shall have a open area equal to at least 3 times the cross-sectional area of pipe in which used (based on NPS) and may be woven wire (20 mesh) or perforated type (0.45-inch maximum diameter perforations).

Pressure Switch: The pressure switch shall be a diaphragm activated, adjustable differential pressure switch with one normally open and one normally closed, 10-ampere, 120-volt AC, snap action contact in a NEMA Type 4 or 4X enclosure. The switch shall have an adjustable differential range of at least 20 psi and shall be factory set to de-energize the pump when the water pressure reaches 60 psi and energize the pump when water pressure drops below 40 psi.

Float Switch: Float switch shall be wide angle type, 120-volt, 5-ampere, AC, single-pole, double throw mechanical switch in inert synthetic casing. Switch shall be leakproof, shockproof, and corrosion resistant. Cable shall be 3-conductor, No. 18 AWG with polyvinyl chloride (PVC) jacket. Switch shall be installed as shown on the plans. The difference between the switch activation elevation and deactivation elevation shall not be greater than 12 inches.

Water Meter (Well): Water meter shall be disc or turbine type, suitable for water service with a magnetic coupling and a minimum 125 psi working pressure. Meter shall be 1 inch and 3 inches with a maximum pressure drop at 150 GPM of 15 psi. Readout shall be in gallons. Water meter shall have 4-20 mA connections.

Heat tape: Heat tape shall be UL listed with a 22 AWG minimum bus wire. Heat tape shall be connected to a circuit that utilizes ground fault interruption. Heat tape shall be rated for no more than 6 watts per linear foot and shall be thermally self-regulating. A line-voltage thermostat shall be used to prevent operation of the heat tape when ambient temperatures are above 5 C.

Static Mixer: Static mixer shall be an in-line type for mixing chlorine with water. The miser unit shall consist of no- moving parts, and shall be contained in a clear PVC pipe with threaded ends. Size shall be as shown on plans.

Chemical Feed Equipment:

The chemical feed equipment shall consist of a flow meter, metering pump, chemical storage tank with rigid cover, tank agitator, tank support, chemical feed monitoring and reporting system, flow indicator, injection check valve, ball valve, all necessary chemical feed tubing and electrical cables, sodium hypochlorite, and a chlorine test kit. The chemical feed equipment shall be supplied by the same manufacturer as a complete packaged unit.

The flow meter shall be a water operated magnetic drive turbine meter with bronze body, polypropylene rotor and ceramic magnet, 7-digit minimum totalizer in gallons, and conform to the requirements in AWWA Standards for Class 1 turbine meters. The meter shall have an external stream mounted magnetic pickup with provisions for sending electronic pulses based upon varying flow to the metering pump.

The unit shall have a maximum pressure drop of 15 psi at 70 GPM.

The metering pump shall be a positive displacement, diaphragm type pump, and electronically controlled with modular construction flow. The pump shall operate independently of line voltage frequency and shall be stroke frequency and length adjustable, anti-siphon, pressure relief set for 175 psi, available for line priming, back pressure limited, and with a minimum input of 0.001 gallons per hour, and maximum adjustable output of 0.19 gallons per hour. The unit shall be 115 volts and be supplied with a line cord and plug.

The chemical storage tank shall be a flat bottom, cylindrical polyethylene tank with a rigid polyethylene cover. Tank exterior shall have graduated markings indicating capacity. Secondary containment polyethylene pan of equal volume will be included with storage tank.

The tank agitator shall be a tank mounted liquid mixer consisting of a motor, 5/16-inch diameter minimum stainless steel shaft, stainless steel or neoprene impeller, and all necessary hardware for mounting and operation. The motor shall be 0.05 horsepower minimum, 115-volt, totally enclosed fan cooled and shall not overload regardless of the liquid level in the solution tank. The agitator shall include a programmable timer to start the motor at least 4 preset times each day.

Chemical feed tubing shall be flexible polyvinyl chloride, installed with a shut-off ball valve, flow indicator, and an injection check valve. Tubing size shall be as recommended by the metering pump manufacturer.

The chemical storage tank support unit shall be capable of adequately supporting the tank, contents, and metering pump. Support unit shall be properly designed for the tank size.

The chemical feed monitoring and reporting system consist of hardware and software which initiates calls to programmed phone numbers when alarm is triggered and is capable of connections with SCADA systems. Alarm conditions shall be: low level in chemical storage tank; metering pump failure; tank agaitator motor failure, and flow meter failure.

The chlorine test kit shall be Environmental Protection Agency (EPA) approved for analysis of potable water. Kit shall be capable of measuring total chlorine in the range from 0 to 3.5 mg/l. Kit shall include case, vials, color comparison standard, and enough chemicals for at least 100 tests.

Sodium hypochlorite shall be 12.5 percent and certified to meet NSF/ANSI Standard 60.

Miscellaneous Metals: Angle iron, steel supports and other miscellaneous metals required for the water supply system shall be in accordance with the requirements specified under "Miscellaneous Metal" in Section 12-5, "Metals," of these special provisions.

PART 3 - EXECUTION

Tank installation: The pressure and storage tanks shall be installed on concrete foundations, anchored and supported in conformance with the manufacturer's recommendations and as shown on the plans.

Surge Tank: Surge tank shall be adequately anchored or strapped to resist horizontal displacement. A union shall be installed on the outlet pipe nipple within 6 inches of the surge tank.

Float Switch: Float switch cable shall be installed with a cable grip bushing and shall be supported at a convenient location near ladder to facilitate field adjustment.

Air Volume Controller: AVC electrode shall be installed to the elevation shown on the plans or manufacturer’s recommendations. The integral pressure switch shall be adjusted to de-energize the air compressor when the tank pressure reaches 2 psi below the water pump cut-off pressure.

Backflow Preventer:

Backflow preventer assembly shall include a strainer, backflow preventer, fittings and pipe. Assembly components shall be the same size as the pipe in which they are installed, unless otherwise shown on the plans.

Backflow preventer shall be installed with a minimum of 12 inches clearance between the lowest portion of the assembly and finished grade or slab, or with the clearance as shown on the plans.

Water Meter: Water meter shall be installed in horizontal piping run with no fittings located within 15 inches of either side of the meter.

Chemical Feed System: The chlorine metering system shall be secured to the wall and shelf or concrete slab by expansion anchors or restraints sized according to manufacturer's recommendations to resist siesmic forces.

Testing:

After the installation work has been completed, the pumping installation shall be tested for conformance with the operating conditions specified herein. The materials and labor required for testing shall be provided by the Contractor at his expense.

Before starting or operating equipment or systems, said systems or equipment shall be flushed and cleaned as required and the equipment shall be lubricated and serviced.

The Engineer shall be notified at least 48 hours in advance of starting the testing.

The measurements of flow shall be by means of venturi meter, a weir, or other reliable means as approved by the Engineer. The water shall be discharged in such a manner that erosion is held to a minimum.

Valves shall be adjusted and the pump operated at no flow, full flow and the flow rates specified on the plans.

The following information shall be tabulated and submitted by the Contractor for each test:

1. Flow rate in gallons per minute.
2. Pumping water level in the well for the well pump or the suction pressure for the booster pump in feet of water.
3. Discharge pressure for the well pump or booster pump in psi. Discharge pressure for the well pump shall be measured at the well head.
4. Total dynamic head.
5. Current reading of the pump motor in amperes.
6. Motor voltage (loaded and unloaded).

At the completion of the installation of the water supply piping the lines shall be made tight and shall be tested under a hydrostatic pressure of 125 psi. The pressure shall be maintained without fluctuation for a period of one hour or longer if required by the Engineer.

The water supply system shall then be operated and checked by the Contractor for a period of at least 3 consecutive 8 hour-days to demonstrate the satisfactory overall operation of the water supply system as a completed unit. The test shall be conducted in the presence of the Engineer. During the test period, final adjustments shall be made to the equipment and components as required to place the system in satisfactory operating condition.

Any equipment, systems, or work found deficient during the test shall be replaced or repaired and retested. The Engineer shall be notified a least 72 hours in advance of starting the retest.

Backflow Preventers:

Backflow preventers shall be tested at the completion of the distribution system installation for proper operation by a certified Backflow Preventer Tester.

The tester shall hold a valid certificate as a Backflow Preventer Tester from the county in which the device is to be tested.

Testing for proper operation shall conform to the procedures of the county in which the testing is being performed

The Contractor shall notify the Engineer at least 5 days prior to testing backflow preventers. Such tests shall be satisfactorily completed after installation of the backflow preventer assemblies and before operation of the systems.

One copy of all test results for each backflow preventer shall be furnished to the Engineer.

12-2.06 SEPTIC SEWAGE DISPOSAL SYSTEM

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing, installing and constructing a septic sewage disposal system in accordance with the details shown on the plans and these special provisions.

Septic sewage disposal system shall include such other materials and appurtenances, not mentioned, which are required for the complete installation and proper operation of the system.

Related Work: Sewer pipes in buildings and to a point 5 feet beyond the building shall be as specified in Section 12-15, "Mechanical," of these special provisions.

Order of Work: Work which will curtail the use of the existing sewage system shall not be done until the facilities utilizing the system are closed and are no longer required.

SUBMITTALS

Product Data:

Material lists for materials to be used shall be submitted for approval and shall include the name of the manufacturer and the source, model number, description, and standard of manufacture.

Septic tank plans and loading calculations shall be submitted for approval. The design and calculations submitted for approval shall be signed by a civil engineer registered in the State of California. The expiration date of the registration shall be shown.

Manufacturer's descriptive data and catalog cuts for the following shall be submitted for approval:

Underground tracer tape
Sewer and drain pipe and fittings
Leach line pipe and fittings
Septic tank (Precast Reinforced Concrete)
Septic tank (Fiberglass)
Manhole frames and covers
Cleanouts
Valves
Valve and meter boxes
Filter fabric
Observation well caps
Septic tank outlet filter
Coatings

Samples: Test results and a representative sample of the following products weighing approximately 25 pounds shall be submitted to the Engineer at the jobsite for approval:

Sand
Leach line backfill
Leach line rock
Pea gravel

Working Drawings: Working drawings for each precast septic tank and fiberglass septic tank including risers, connections, bolted covers, inlet, outlet and anchoring plan for the septic tank shall be submitted for approval. Complete bedding, assembly, installation and backfilling instructions shall be submitted for approval.

QUALITY ASSURANCE

Codes and Standards: All sanitary sewage work shall conform to the applicable portions of the CPC, California Code of Regulations, Title 24, Part 5.

The septic tank and recirculation tank shall be manufactured in accordance with the California Code of Regulations, Title 23, Division 3.

Certificates of Compliance: Certificates of compliance shall be furnished for manhole frames and covers in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2 - PRODUCTS

IDENTIFICATION

Underground Tracer Tape: Underground tracer tape shall be permanent, detectable, bright colored, continuous printed plastic tape intended for direct burial service; not less than 2 inches wide; lettering shall read "CAUTION SEWER BURIED BELOW."

PIPES AND PIPE FITTINGS

Sewer and Drain Pipe and Fittings: Sewer and drain pipe and fittings shall be polyvinyl chloride (PVC) gravity sewer plastic pipe and fittings conforming to ASTM Designation: D 3034, Standard Dimension Ratio (SDR) 35, with integral bell and bell and spigot rubber gasketed joints or conforming to ASTM Designation: D2665 with solvent welded fittings. Rubber gaskets shall conform to ASTM Designation: F 477. Stainless steel clamps with rubber boots shall not be used.

Sewer Pipe Adapters: Sewer pipe adapters for PVC to cast iron soil or clay pipe shall be appropriately sized PVC flexible coupling manufactured for connecting dissimilar pipes. Adapters shall be attached to piping with adjustable stainless steel band clamps with hex tightening screws. Rubber boots will not be allowed. Sewer pipe adapter shall be Indiana Seal; Fernco; or equal.

Outlet Filter: Outlet filter shall be commercial quality PVC or Ethyl 7042 compound case with a removable, self-cleaning impact styrene filter capable of effectively removing all particles of 1/8 inch or greater in diameter. Filter shall be multi-purpose and shall have a capacity of 1500, 4000, and 8000 gallons per day.

Leach Line Pipe:

Leach line pipe shall be perforated PVC plastic sewer pipe and fittings, standard dimension ratio, (SDR) 35, conforming to ASTM Designation: D 3034; or perforated PVC drain, waste and vent pipe, (PVC-DWV), conforming to ASTM Designation: D 2665.

Perforations shall be 1/2 inch or 5/8 inch in diameter, located in 2 rows 120 degrees apart and spaced at intervals between 3 inches to 5 inches. Piping which is manufactured without the required drain holes shall have the holes drilled using approved drilling equipment and jigs. Burrs on the pipe surfaces resulting from the drilling operation shall be removed.

MANHOLES, METER AND VALVE BOXES

Manholes: Manholes and distribution box riser sections and cones shall be precast, reinforced concrete conforming to ASTM Designation: C 478 or precast reinforced concrete pipe conforming to ASTM Designation: C 76.

Manhole Frame and Cover for Precast Septic Tank: Manhole frame and cover shall be gray cast iron, conforming to ASTM Designation: A 48, Class 30 or greater (traffic type). Cover shall be T-handle bar lock (no bolt), closed pick hole and shall be marked "SS," "SEWER," or "SANITARY SEWER." Three T-handles

shall be supplied. The side or bottom of the cover shall be machined grooved for an integral O-ring gasket. The frame seat for the bottom O-ring gasket shall be a minimum of 7/8 inch in width.

Meter Box: Meter box shall be precast concrete with cast iron cover. Cover shall be factory marked "SEWER," "SS," or "SANITARY SEWER", and shall be traffic rated. Meter box shall be Bes, No. C9W with C15 cover; Christy, No. B9 with B9C cover; Cook Concrete Products, No. 14 with 14-T cover; or equal.

SEPTIC TANK: PRECAST REINFORCED CONCRETE

Septic Tank: Septic tank shall be a precast reinforced concrete tank of the size shown on the plans. All joints shall be above the normal operating water level. The septic tank shall be 1) listed and approved by the International Association of Plumbing and Mechanical Officials (IAPMO) and tank shall be marked accordingly, or 2) the design shall be stamped and certified by a California Registered Engineer as meeting the general industry standards necessary to comply with these standards.

Cones and risers shall be precast, reinforced concrete, conforming to ASTM Designation: C 478 or precast reinforced concrete pipe conforming to ASTM Designation: C 76.

SEPTIC TANK: FIBERGLASS

Septic tank shall be a factory manufactured fiberglass cylindrical tank meeting the standards of UL: 1316 with single wall construction. The septic tank shall have fiberglass cloth reinforcing including striker plates located under each opening. The septic tank shall be designed for H-20 loading at a depth of 7-feet and listed and approved by the International Association of Plumbing and Mechanical Officials (IAPMO) and marked accordingly, or the design shall be stamped and certified by a California Registered Engineer as meeting the general industry standards necessary to comply with these standards.

Deadmen, anchors, and cabling shall be supplied by the tank manufacturer, or if field constructed, shall be constructed with Concrete (Minor Work).

Septic tank shall be designed to support all the loads and pressures resulting from the following vertical and lateral earth loading:

1. Minimum 4-foot cover over the tank.
2. Earth Density: 140 pounds per cubic foot for saturated backfill or 127 pound per cubic foot for unstaurated backfill minimum.
3. Lateral loading: 62.4 pounds per cubic foot minimum and shall be determined from ground surface.
4. Concentrated wheel loading: 2500 pounds.
5. All construction or appurtenance joint(s) shall be above the tank waterline.

Maximum initial deflection shall not exceed 3 percent of tank diameter.
Mimimum wall thickness shall be 3/16 inch.

Septic tank shall be furnished with access openings to accommodate the septic tank flanged adapter sized for a 30-inch diameter manhole. The septic tank shall be equipped with 30-inch minimum diameter access manholes, flanged tank adapters, risers, bolted covers, inlet fittings; outlet fittings; and all appurtenances.

A flanged septic tank adapter to facilitate the bonding of the 30-inch diameter access risers shall be bonded to the tank. The flanged septic tank adapter shall be made of ¼-inch thick ABS and have an overall height of no less than 3 inches. For 30-inch diameter access risers, either a grooved septic tank adapter plate or a flanged septic tank adapter may be installed in the septic tank. The adapter shall be manufactured of fiberglass or ABS and shall accommodate a 30-inch diameter access riser.

Risers shall be 30 inch access, PVC or fiberglass as shown on the plans, conforming to ASTM Designation: ASTM F794 or equal.

Cover shall be bolted, closed pick hole and shall be marked "SS," "SEWER," or "SANITARY SEWER." The bottom of the cover shall include a molded or cast-in gasket. The seal ring and the frame seat shall be sized to fit a 30 inch riser.

The riser-to-tank connection shall be capable of withstanding a vertical uplift of 5000 pounds to prevent riser separation due to tank settlement, frost heave, or accidental vehicle traffic over the tank.

Inlet plumbing shall include an inlet tee that penetrates the tank a minimum of 10" and extends down a minimum of 18 inches through the flow line as shown on plans. (The depth may vary depending on the tank's height; in all cases, though, the inlet should extend to a level below the bottom of the maximum scum depth.)

Air vents and granulated activated carbon filter shall be made of non-corrosive material, withstand ambient weather conditions and include a granulated activated carbon filter (GAC). The GAC shall be replaceable and fit a 4 inch pipe size. The GAC shall be bonded to a 4 inch PVC pipe and the pipe shall be bonded to the septic tank.

All attachment components shall be constructed of waterproof, non-corrosive materials, such as PVC, ABS, fiberglass, or stainless steel.

Adhesives and sealants shall be waterproof, corrosion resistant and approved for the intended application.

To ensure product compatibility, a single manufacturer shall supply adapters, risers, covers, inlet fittings, outlet fittings, and attachment components for the septic tank.

Manufacturers shall warrant the septic tank not to fail from internal or exterior corrosion for a period of 1 year from date of purchase. The warranty shall not contain disclaimers for the influent constituents specified to be removed.

CLEANOUTS

Cleanout to Grade: Cleanout piping shall terminate with an appropriately sized flexible PVC access cap and stainless steel band coupler with hex tightening screw. Rubber coupling or cap will not be allowed. Access cap shall be Indiana Seal; Fernco; or equal.

MONITOR WELLS

Monitor Wells: Monitor wells shall be sewer pipe, SDR 35, conforming to ASTM Designation: D 3034; or plastic drain, waste, and vent pipe, conforming to ASTM Designation: D 2665, perforated as shown on the plans, and terminating with an appropriately sized flexible PVC access cap and stainless steel band coupler with hex tightening screw threaded cap fitting.

MISCELLANEOUS MATERIALS

Cement Mortar: Cement mortar shall be one part cement to 2 to 3 parts clean plaster or concrete sand mixed with just enough water for suitable consistency.

Epoxy Adhesive: Epoxy adhesive shall be commercial quality low viscosity paste polysulfide extended epoxy formulated primarily for use in bonding new portland cement concrete to existing portland cement concrete.

Joint Sealant: Plastic joint sealant shall be commercial quality butyl mastic strip type, conforming to ASTM C-900, Henry; Press-Seal; or equal.

Sand: Sand shall be clean, washed sand, free from clay or organic material graded such that 90 percent to 100 percent passes the No. 4 sieve size and not more than 20 passes the No. 50 sieve size.

Leach Line Backfill: Leach line backfill shall be native material free of rocks greater than 2 inches in greatest dimension, vegetable matter, trash or other deleterious material.

Leach Line Rock:

Leach line rock shall be washed, clean, graded gravel, rock, or crushed rock varying in size between 3/4 in and 2½ inches in greatest dimension. Rock shall have not more than 10 percent loss when tested in accordance with California Test 214. Tests may be waived if rock is from an approved supply or is accompanied by a Certificate of Compliance conforming to the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Pea Gravel: Pea gravel shall be clean aggregate, free from clay or organic material and graded such that 90 percent to 100 percent passes the No. 4 sieve size, and not more than 50 percent shall pass the No. 30 sieve size.

Filter Fabric:

Filter fabric shall be commercial quality, chemically stable, non-biodegradable, ultraviolet stabilized, 100 percent polyester, 100 percent polypropylene or 100 percent combined polyester and polypropylene, nonwoven, needle punched permeable geotextile.

Filter fabric shall be shipped in packaging that shall protect filter fabric from ultraviolet radiation and abrasion during storage and handling. Filter fabric shall be Mirafi, 140N; AMOCO Fabrics, 4506; or equal.

Filter fabric shall conform to the following requirements:

Property	Value	Test Designation
Average roll weight	4.0 ounces per square yard, min.	ASTM D 1117
Grab tensile strength, Pounds	MD 120 ±15 XMD 110 ±15	ASTM D 5034, 5035 1 inch grip
Grab elongation	MD 50 min.	ASTM D 5034, 5035
Trapezoidal tear strength, Pounds	MD 50 ±10 XMD 45 ±10	ASTM D 1117
Water passage rate	100 gallons per minute per square foot, min.	ASTM D 4491 (Constant head, 2 inches)
Thickness, mils	55 min.	ASTM D 1777
Permeability, cm per sec.	0.3 cm per sec.±0.1 cm per sec.	ASTM D 4491 (Constant head, 2 inches)
AOS (Avg. opening size)	0.21 mm, min.	ASTM D 4751

Epoxy Mortar: Epoxy mortar shall be a commercial quality trowelable 3-component epoxy mortar consisting of 2 pourable epoxy components and a chemically resistant aggregate filler of silica quartz sand with maximum water absorption of 0.1 percent. Epoxy shall have a pull-off strength of not less than 1,000 psi and a 90 percent cure in 24 hours. Epoxy mortar shall be the type that requires no primer as bonding agent.

COATINGS

Bituminous Coating: Bituminous coating shall be cold applied coal or epoxy based single component, self-priming, heavy-duty protective coating designed for buried concrete. Bituminous coating shall be Devoc, Devtak 5A; Polykem, 938; Tnemec, 46-465; or equal.

PART 3 - EXECUTION

PREPARATION

INSTALLATION OF IDENTIFICATION

Continuous underground tracer tape shall be installed directly above the buried line and 6 inches to 8 inches below finished grade during backfilling operations.

INSTALLATION OF PIPES AND FITTINGS

Sewer and drain pipe shall be installed upgrade unless otherwise permitted by the Engineer.

Closing Abandoned Utilities: Open ends of abandoned underground utilities shall be closed. Sufficiently strong closures, either 6 inches of concrete or pipe cap with concrete thrust block, shall be placed to withstand hydro-static pressure which may result after the pipes are closed.

Sewers Near Water Lines:

Sewers near water lines shall be installed below water lines in the same trench, in parallel trenches less than 10 feet apart, or at any crossing.

When water lines cross above a sewer line, a vertical separation of not less than 12 inches shall be maintained between the top of the sewer pipe and the bottom of the water line.

Connections between Differing Pipe Types: Joints between different types of pipes shall be made with sewer pipe adapters intended for that purpose.

Damaged Pipe: Damaged pipe shall be replaced prior to use. Misaligned pipe shall be corrected or replaced prior to use.

Cleaning Pipe:

Interior of pipes shall be cleaned of dirt and other materials as the work progresses.

Lines between manholes shall be flushed as necessary to remove collected material.

Interior Inspection: Interiors of pipes shall be inspected to determine displacement or damage during installation or backfilling.

INSTALLATION OF SEPTIC TANKS, MANHOLES, METER AND VALVE BOXES

Sewer Structures:

Manufactured sewer structures shall be installed in accordance with the manufacturer's recommendations and to the lines and grades shown on the plans.

Fiberglass Septic Tank:

The tank and anchoring system shall be installed in accordance with manufacturer's instructions and as shown on the plans..

Risers shall be constructed watertight and to a height as shown on the plans. The risers shall be attached to the tanks such that a watertight seal is provided and have a bolted removable cover. Risers shall extend 3 inches above gravel fill inside traffic rated steel vault.

The riser-to-tank connection shall be watertight and structurally sound. The riser-to-tank connection shall be capable of withstanding a vertical uplift of 5000 pounds to prevent riser separation due to tank

settlement, frost heave, or accidental vehicle traffic over the tank. Riser installation shall be accomplished according to the manufacturer's instructions.

Air vents with granulated activated carbon filter (GAC) shall be installed to septic tank premanufactured air vent openings. All attachment components shall be constructed of waterproof, non-corrosive materials, such as PVC.

The PVC vent pipe-to-tank connection shall be watertight and structurally sound. The PVC-to-tank and PVC to surface air vent and granulated activated carbon filter connection shall be capable of withstanding a vertical uplift of 5000 pounds to prevent separation due to tank settlement, frost heave. Air vent GAC and fiberglass box and vented cover installation shall be accomplished according to the manufacturer's instructions.

Septic tank shall be filled to operating level with clean, fresh water upon completion of construction and testing.

No individual structure shall be constructed to final grade until the paving or surfacing grades have been established in the immediate area.

All construction joints shall be watertight.

Precast Septic Tank:

All joints and penetrations of precast septic tanks, septic tank manholes and distribution boxes shall be sealed watertight, inside and outside, with epoxy mortar or joint sealant.

Interior of all tanks shall be cleaned of all debris after installation of tank, barrels and manhole frame and covers is complete and prior to testing. All debris from flushing and testing shall be removed prior to use.

Slabs and Collars shall be broom surface finished. Slabs and Collars shall match existing/finished grade. Compaction prior to form work shall be as specified elsewhere in these special provisions.

Where manholes, pipe inlets or cleanouts to grade are located in areas to be paved or surfaced, no individual structure shall be constructed to final grade until the paving or surfacing has been completed immediately adjacent to said structure.

INSTALLATION OF CLEANOUTS

Cleanouts shall be installed 90 degrees to finished grade and shall terminate in a valve box. A concrete pad shall be provided full width of the trench under a wye branch.

Cleanouts to grade shall be a combination of fittings as shown on the plans. Piping and fittings for 4-inch pipe shall be sewer pipe. Piping and fittings for 3-inch pipe and smaller shall be drain pipe.

Collars shall be broom surface finished. Collars shall match existing/finished grade. Compaction prior to form work shall be as specified elsewhere in these special provisions.

INSTALLATION OF LEACH LINES

Leach Lines:

Leach line construction shall be performed in dry weather. The excavation for leach lines shall not commence until the soil moisture condition is dry to a depth of 2 inches as defined in the following definition from Table 3, "Criteria for Describing Moisture Condition," in ASTM Designation: D 2488: "Absence of moisture, dusty, dry to the touch."

The trenches shall be prepared by carefully raking sidewalls and the bottom to remove any smeared or glazed soil surfaces. All loose material shall be removed from the trench. Sharp objects which may damage the filter fabric shall be removed during backfilling operations.

Leach line trenches shall not remain exposed to the elements for more than one day after excavation. Open trenches shall not, under any circumstances, be exposed to rainfall, or any other external source of moisture.

A single layer of filter fabric extending the full perimeter of the trench shall be placed immediately adjacent to the bottom and sides of the trench prior to placing leach line rock. All splices in the filter fabric shall have a 12-inch minimum overlap. Washed rock shall be placed in the center of the trench to minimize disturbance of the trench sidewalls.

Leach line pipe shall be installed on prepared rock layers to the invert elevations shown on the plans and to flat grades established by accurate survey methods. Pipes shall be within 1/4 inch of the required grade and installed with perforated sides down.

Washed rock fill material shall be placed evenly on both sides of the leach line pipe and above the pipe in such a manner as to prevent displacement or disturbance of the pipe system.

Leach line crossover inverts shall be placed by accurate survey methods and shall be within 1/8 inch of the required grade.

Sand and backfill placed above the leach line filter fabric shall be placed without adding water. The backfill material shall be placed in 6-inch maximum thickness lifts and, unless otherwise shown on the plans, mounded 3 inches above the trench. Backfill shall not be compacted.

APPLICATION OF COATINGS

The interior and exterior surfaces of precast sewer structures, and the exterior surfaces of cast-in-place concrete sewer structures, except the exterior bottom of tanks, shall be completely coated with 2 applications of bituminous coating, applied at a rate of 100 square feet per gallon.

The preparation of surfaces to receive coatings shall be in accordance with the coating manufacturer's recommendations.

Concrete surfaces to be coated shall not be coated until 28 days after the last concrete for these structures has been poured.

The edge and bottom of manhole cover seat areas shall be coated with a uniform application of heavy duty, waterproof automotive or industrial grease.

FIELD QUALITY CONTROL

TESTING

Testing Pipes:

All sewer and drain pipes shall be tested for obstructions before covering the pipes by balling and flushing the pipes with an approved commercial sewer cleaning ball. The ball shall be moved slowly through the sewer with a tag line. Four-inch sewer pipe shall be tested by pulling an appropriate sized inflatable plug through the pipe. Obstructions or irregularities shall be removed or repaired.

Sewer and drain pipes shall be tested for leakage for a minimum period of 4 hours by filling with water to an elevation of 4 feet above the average invert of sewer, or to the top of the manholes where less than 4 feet deep. The system shall show no visible leaks, and the leakage rate shall not exceed 3.5 gallons per 24 hours, per 1-inch diameter, per 100 feet of pipe. Sewers may be tested in sections with the test water

progressively passed down the sewers if feasible. Water shall be released at a rate which will not create water hammer or surge in the plugged section of sewer.

In lieu of hydrostatic test with water, the air test method, "Air Test," as outlined in the CPC, may be used.

Testing Fiberglass Septic Tank:

Prior to backfill, the septic tank shall be tested for watertightness for a period of 24 hours. All seams and joints shall be left exposed (except the bottom of the tank) for inspection purposes. The tank shall remain watertight.

Inlets to the septic tank will be watertight pipe seal. Each tank shall be tested at the site, by filling with water to the soffit and letting stand for 24 hours then drained.

The tank shall be refilled to the soffit and the exfiltration rate shall be determined by measuring the water loss during the next two (2) hours. Any leakage shall be cause for rejection.

After installation and initial testing is completed and before backfilling, each tank shall be filled with water to a point 2-inch above the top of the tank and the water loss measured after a twenty four-hour period.

After it has been determined that there is no leakage, test the access riser seam.

Backfill to a minimum depth of 2-inch above the riser seam to prevent damage from hydrostatic uplift. Fill the tank to a point 2-inch above the riser seam (the field test period may be reduced to not less than two (2) hours).

No tank will be accepted if there is any leakage over the two (2) hour period. Repairs, if necessary, shall be made at the Contractor's expense.

The septic tank system shall be operated continuously for 8 hours on 4 consecutive days. Water shall be introduced into the septic tank at approximately 25 GPM for 30 minutes of each hour. System shall show no signs of leakage or backup. Repairs, if necessary, shall be made at the Contractor's expense.

Testing Precast Septic Tank: The septic tank shall be tested for leakage by filling the tank with water to the outlet flow line for a period of 24 hours. The tank shall remain watertight. Repairs, if necessary, shall be made at the Contractor's expense.

12-2.07 COMMUNICATIONS TOWER

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of designing, fabricating, furnishing and installing a communications tower, including foundation, in accordance with the details shown on the plans and these special provisions.

The antennas, waveguides, and cables will not be included.

The communications tower shall be designed, constructed assembled and installed in accordance with applicable requirements of the the Telecommunications Industry Association (TIA).

Concrete and reinforcement shall conform with the provisions in "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

Communications tower electrical requirements shall conform with the provisions in "Basic Materials and Methods," in Section 12-16, "Electrical," of these special provisions.

Cleaning and painting shall conform with the provisions for the particular type of substrate material under "Painting" in Section 12-9, "Finishes," of these special provisions.

SYSTEM DESCRIPTION

Design Requirements:

The tower shall be designed to conform to the ANSI/TIA/EIA 222 G for drift, sway and twist at a frequency of 6 gigahertz, under a minimum of 1/2-inch of solid radial ice condition per ANSI/TIA/EIA 222 G and a wind speed of 120 mph, 3 second gust.

All antenna and appurtenances wind loading calculations shall be developed using ANSI/TIA/EIA 222 G. Wind loading values for microwave antennas shall used ANSI/TIA/EIA 222 G Annex C: Design Wind Force On Typical Antennas (Normative).

Under wind pressures up to 35 mph (5 psi), all horizontal members shall be capable of supporting a 300 lb. vertical load at mid-span, in addition to all other design loads.

The square foot area of each VHF/UHF antenna and its associated outrigger shall be calculated as 10 square feet when developing the tower basic wind speed loading and when developing the tower ice loading.

The tower snow loading and all appurtenances snow loading installed shall meet or exceed the requirements of California Building Code, 24 CA Code of Regs, Pt2, Ch 16A 1608A Snow Loads.

Snow loads shall be assumed as a minimum of 1 inch in depth at the ground level.

The communications tower shall be oriented with the North outside face aligned to 90° / 270° clockwise from TRUE North.

The communications tower shall be a four legged open lattice type tower, Valmont (Microflect) model 108-M840-120, or equal.

The communications tower height shall be 120 feet (± 1 foot).

The communications tower shall have a face width of 9 feet (± 1 foot) at the 120 foot elevation.

The communications tower shall have a face width of 17 feet (± 1 foot) at the ground elevation.

The maximum limit of complete telecommunications tower twist at the antenna attachment point shall not exceed:

1. 2.0° at an elevation of more than 80 feet.
2. 0.7° at an elevation of 80 feet and lower levels.

The twist requirement shall be maintained through wind speeds to 70 mph. The communications tower twist at all antenna mounting elevations shall be determined by analytical methods and shall be noted on the formal type-written detailed stress analysis.

The maximum limit of the complete communications tower sway at the antenna attachment point shall not exceed:

1. 2.0° at an elevation of more than 80 feet.
2. 0.7° at an elevation of 80 feet and lower levels.

The sway requirement shall be maintained through wind speeds to 70 mph. The communications tower sway at all antenna mounting elevations shall be determined by analytical methods and shall be noted on the formal type-written detailed stress analysis.

The communications tower deflection limits shall be maintained both vertically and horizontally. The communications tower deflection shall be determined by analytical methods at each specific point on the tower where an antenna is attached and shall be noted on the formal type-written detailed stress analysis.

The foundation for the communications tower and antennas shall be designed and constructed in conformance with the requirements of the CA Code of Regs, Title 24, CBC, Part2.

The tower and footings shall be designed to support the following microwave antennas and their mounting structures at the heights and locations indicated:

ANTENNA #1

Antenna size	10'
Center line height of antenna	70'
Azimuth from true North, clockwise	70°
Operating frequency	6 GHz
Location of distant end of MW path	future
Antenna type	Parabolic
Antenna manufacturer	Andrew Corp.
Antenna manufacturer model	UHX10-65
Radome manufacturer	Andrew Corp.
Radome requirements	Yes
Second antenna strut required	Yes
Antenna mount type	Pipe 4 1/2" O.D.
Antenna mount style	4' minimum x 4 1/2" dia.
Antenna mount location	Center East face
Number of antenna waveguide runs	1 each

ANTENNA #2

Antenna size	10'
Center line height of antenna	30'
Azimuth from true North, clockwise	70°
Operating frequency	6 GHz
Location of distant end of MW path	Wolf
Antenna type	Parabolic
Antenna manufacturer	Andrew Corp.
Antenna manufacturer model	UHX10-65
Radome manufacturer	Andrew Corp.
Radome requirements	Yes
Second antenna strut required	Yes
Antenna mount type	Pipe 4 1/2" O.D.
Antenna mount style	4' minimum x 4 1/2" dia.
Antenna mount location	Center East face
Number of antenna waveguide runs	1 each

ANTENNA #3

Antenna size	10'
Center line height of antenna	60'
Azimuth from true North, clockwise	260°
Operating frequency	6 GHz
Location of distant end of MW path	future
Antenna type	Parabolic
Antenna manufacturer	Andrew Corp.
Antenna manufacturer model	UHX10-65
Radome manufacturer	Andrew Corp.
Radome requirements	Yes
Second antenna strut required	Yes
Antenna mount type	Pipe 4 1/2" O.D.
Antenna mount style	4' minimum x 4 1/2" dia.
Antenna mount location	Center West face
Number of antenna waveguide runs	1 each

In addition to the microwave antennas the tower shall also be designed to support the following UHF and VHF antennas and their mounting structures at the heights and locations indicated:

ANTENNA #4

Antenna mounting height	120'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Top of tower, Northeast corner leg
Antenna mount type	6' Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #5

Antenna mounting height	120'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Top of tower, Southeast corner leg
Antenna mount type	6' Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #6

Antenna mounting height	120'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Top of tower, Southwest corner leg
Antenna mount type	6' Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #7

Antenna mounting height	120'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Top of tower, Northwest corner leg
Antenna mount type	6' Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #8

Antenna mounting height	80'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Northeast corner leg
Antenna mount type	6' Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA 9

Antenna mounting height	80'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Southeast corner leg
Antenna mount type	6’ Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #10

Antenna mounting height	80'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Northwest corner leg
Antenna mount type	6’ Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #11

Antenna mounting height	80'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Southwest corner leg
Antenna mount type	6’ Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #12

Antenna mounting height	60'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Northeast corner leg
Antenna mount type	6’ Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #13

Antenna mounting height	60'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Southeast corner leg
Antenna mount type	6’ Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #14

Antenna mounting height	60'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Southwest corner leg
Antenna mount type	6’ Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

ANTENNA #15

Antenna mounting height	60'
Antenna length above mounting position	15'
Antenna length below mounting position	2'
Antenna mount location	Northwestcorner leg
Antenna mount type	6’ Standoff Wireless Mount
Antenna type	Omni
Antenna manufacturer	Kreco.
Antenna manufacturer model	CO-41AN

SUBMITTALS

Product Data: Manufacturer's descriptive data and installation instructions shall be submitted for approval. A quality control manual and welder qualifications for shop and field welding shall be submitted.

Working Drawings:

Working drawings and design calculations for the communications tower shall be submitted for approval. Design calculations shall show the structural members, governing codes, design criteria, stress level, displacement and drift. Working drawings shall be prepared, stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California.

Working drawings shall show any changes proposed in the work, details for connections not dimensioned on the plans, the sequence of shop and field assembly and erection, welding sequences and procedures. If

required, the location of butt welded splices on a layout drawing of the entire structure, and the location and details of any temporary supports that are to be used.

If design calculations consist of computerized or tabulated calculations for a series of manufactured products, the portions and values pertaining to this project shall be identified, described and indexed.

Working drawings and design calculations for the communications tower foundation shall be submitted for approval. Design calculations shall show the size of concrete foundations, reinforcement, governing codes, and design criteria. Working drawings shall be prepared, stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of compliance shall be furnished for the communications tower in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Communications Tower Manufacturer Certifications:

The Contractor shall certify that the Contractor has had experience for a minimum of 10 years in the immediate past in communications Tower Work.

The Contractor shall submit a Projects List for a minimum of 10 years in the immediate past in communications Work for the Contractor within the State of California; the List shall at a minimum include:

1. Names
2. Titles
3. Addresses
4. Telephone numbers of project references and contacts, project address, dates, significance of contribution, and other relevant project experience; and other items of information the State may elect to require.

Qualifications for Welding: All welding processes and welding operators shall be qualified in conformance with the requirements in AWS B2.1 Specification for Welding Procedures and Performance Qualifications. A certified copy of qualification test record for welders shall be submitted to the Engineer at the jobsite. Descriptive data for equipment for field welding structural steel, including type and electric power requirements, shall be submitted for approval.

Codes, Regulations, and Standards:

The communications tower and all appurtenances constructed shall meet or exceed the requirements of an essential facility per the California Building Code, 24 CA Code of Regs, Pt 2, Ch 16A, Structural Design.

The communications tower and all appurtenances constructed shall meet or exceed the requirements of the American Society of Civil Engineers, ASCE 7, Minimum Design Loads for Buildings and Other Structures, Occupancy Category IV.

Welding of steel shall be in accordance with American Welding Society (AWS) D 1.1, Structural Welding Code Steel.

All fabrication, erection and identification of structural steel shall conform to the requirements in AISC 303, Code of Standard Practice for Steel Buildings and Bridges.

The fixed ladder and safety cable system shall conform to the requirements in 8, CA Code of Regs, Ch 4, Subch 7, Group 1, Article 4, § 3277 - Fixed ladders, inclusive.

The communications tower and all tower mounted appurtenances shall conform to the requirements in the ANSI/TIA/EIA 222G, Structural Standards for Antenna Supporting Structures and Antennas, including all ANSI/TIA/EIA 222 G Annexes.

Painting of the communications tower shall be in conformance with the requirements in the Federal Aviation Administration (FAA) Advisory Circular AC 70/7460-1K.

The lightning protection and grounding system shall conform to the requirements in the building ground system requirements of the California Electric Code, 24 CA Code of Regs, Pt 3, and NFPA 780 for Class II structures.

DELIVERY, HANDLING AND STORAGE

Structural materials shall be loaded, transported, unloaded, and stored so that they are kept clean and undamaged. Material shall be stored above ground on platforms, skids, or other supports. Covers and protection shall be provided to protect the materials from corrosion.

PART 2 - PRODUCTS

Communications Tower:

Communications tower shall be a self-supporting steel tower, 120 feet in height with concrete footings.

Tower framing members, brackets, fasteners, accessories, appurtenances, and supplementary parts shall be hot-dip galvanized after fabrication.

Communications tower shall include work platforms, antenna mounting structures, waveguide and coaxial cable support system, fixed ladder and mounting platform, waveguide bridge to the equipment building, ice shields, tower lightning protection and grounding system, and FAA approved tower lightning protection and painting.

Microwave Antenna Mounting Structure:

The microwave antenna mounting structure shall consist of a vertically positioned pipe mount, side struts, and associated mounting hardware. The microwave antenna mounting structure shall be supplied by the communications tower manufacturer. The angle of the pipe mount shall be true vertical (± 2°) in all planes.

The pipe mount shall be 4-inch dia. standard weight galvanized steel pipe conforming to the requirements in ASTM A 53, Grade B, measuring a minimum of 6 feet, and a maximum of 8 feet in length.

Each microwave antenna mounting structure shall include two associated microwave antenna side struts located within 8 feet of the respective microwave antenna horizontal center line. The side strut locations shall be within 25 degrees of the antenna's horizontal centerline. The side strut locations shall meet the support requirements listed by the microwave antenna manufacturer, in their current microwave antenna installation bulletin. The side strut locations shall be adequate to maintain the respective microwave antenna within 3 DB of the antenna beam width through winds up to 70 miles per hour, and survive winds up to 125 miles per hour without damage. If calculations require it, a bottom strut shall be supplied.

Mounts and side struts shall meet or exceed the standards specified by the antenna manufacturer in their latest installation bulletin.

Pipe mounts shall be positioned to prevent the antenna feed horn assembly from being directly opposite a tower member. Pipe mount positioning shall not prevent direct waveguide installation to any antenna.

The microwave antenna mounting structure shall be secured to the tower leg with a minimum of two u bolts, at both its upper end and at its lower end, or a minimum four bolt assemblies, at both its upper end and at its lower end.

Antenna mounts shall be positioned to allow the indicated antenna to be adjusted in horizontal azimuth continuously from plus 18 degrees through minus 18 degrees of the indicated antenna azimuth.

Antenna mounts shall be positioned to allow the indicated antenna to be adjusted in vertical altitude angle continuously from plus 3 degrees through minus 9 degrees of zero horizontal angle.

A microwave antenna mounting structure shall be furnished and installed at each microwave centerline height for each antenna at its respective azimuth, as identified in Microwave Antenna section above.

Where the communications tower leg, at the position required for a microwave antenna mount structure, is vertical, and is a 4 inch diameter pipe (4 ½" O.D.) the microwave antenna may be mounted directly to said tower leg, and no pipe mount is required.

VHF / UHF Antenna Mounting Structure:

The VHF and UHF antenna mounting structures shall consist of a standoff for pipe mount, side struts, and pipe mount. The antenna mounting structure shall be the communications tower manufacturer's standard VHF and UHF antenna mounting kit for a pipe leg tower. The antenna mounting structures used shall depend upon the tower leg diameter at the mounting elevation.

The VHF and UHF antenna mounting structures shall include all mounting assemblies, u-bolts, strut mounting brackets and appurtenances.

The VHF and UHF antenna mounting structures shall be furnished and installed at each microwave centerline height for each antenna at its respective azimuth, as identified in the VHF and UHF Antenna section above.

Vertical Waveguide and Coaxial Cable Support System:

The communications tower shall contain a vertical waveguide and coaxial cable support system.

The support system shall be (1) rigid, (2) easily accessed from the fixed ladder, and (3) located within 20 inches of the fixed ladder.

The support system shall include cushion hangers with spring nuts.

The support system shall be designed to support the following waveguides and coaxial cables:

Antenna number	Height above ground level	Waveguide/cable outside diameter	Andrew Corp. model number
1	70'	2.01" x 1.16"	EW63
2	30'	2.01" x 1.16"	EW63
3	60'	2.01" x 1.16"	EW63
4	120'	1.1"	LDF5-50A
5	120'	1.1"	LDF5-50A
6	120'	1.1"	LDF5-50A
7	120'	1.1"	LDF5-50A
8	80'	1.1"	LDF5-50A
9	80'	1.1"	LDF5-50A
10	80'	1.1"	LDF5-50A
11	80'	1.1"	LDF5-50A
12	60'	1.1"	LDF5-50A
13	60'	1.1"	LDF5-50A
14	60'	1.1"	LDF5-50A
15	60'	1.1"	LDF5-50A

Where installed vertically, the support system support bars shall be installed at no more than 30-inch centers.

The entire vertical run of the support system shall be supported to the tower at no more than 10 feet of vertical run.

Waveguide and cable clamp heads shall be attached to the support system supports.

Where installed horizontally, the support system shall include manufacturer's ice shields.

Where installed horizontally, the support system support bars shall be installed at no more than 30-inch centers.

Where installed horizontally, the microwave antenna support system shall be supported at no more than 36-inch centers.

For parabolic type microwave antennas, the support system shall terminate from 4 to 12 inches below the antenna horizontal center line, and from 4 to 12 inches behind the rear of each antenna mounting position.

For horizontal microwave antennas, the support systems shall terminate approximately 8 inches above the microwave antenna port for each respective antenna.

The support system shall terminate at the waveguide bridge at the tower leg closest to the equipment building.

Fixed Ladder:

The communications tower shall contain one fixed ladder and ladder safety cable system, located on the East tower face.

The fixed ladder shall be fabricated of steel. Step bolts will not be allowed. The maximum allowable spacing of the horizontal step rungs shall be 12 inches. The minimum diameter of the step rungs shall be 3/4-inch and shall support a concentrated minimum load of 300 lbs. The minimum allowable spacing of the side rails shall be 16 inches.

A clear climbing space shall be maintained on the climbing side of the ladder extending a minimum of 30 inches from the center of the ladder step rungs out at a right angle to the rungs, and a minimum of 15 inches from the center line of the ladder step rungs parallel to the rungs. Siderail pieces shall be ground to match at butt connections prior to galvanizing.

The fixed ladder and supports shall be fabricated from and supported by rigid steel members. Cables will not be allowed. Galvanizing of material 1/8 inch thick or thicker shall be performed after fabrication into the largest practical sections.

The fixed ladder system shall contain an approved ladder safety cable system.

The safety cable system shall include cable with intermediate cable guides every 25 feet, and fall arrestors. The 3/8-inch minimum diameter, steel aircraft cable shall extend from the ground level to the top of the tower, fastened at the ends. End fasteners shall be supplied by the safety cable manufacturer.

The safety cable system shall meet or exceed OSHA and ANSI requirements for tower climbing ladder safety.

The bottom 10 feet of the fixed ladder shall have an anti-climbing shield specifically designed for the safety cable system.

The communications tower legs shall contain step bolts, on each of the tower legs, above the elevations of 20 feet.

Waveguide Bridge:

The communications tower shall contain a 24-inch wide waveguide bridge kit extending from the communication tower to the equipment building. The wavebridge kit shall include the bridge, cushion hangers with brackets, dual pipe supports (bolted anchor type) with X bracing every 10 feet, and related hardware.

The waveguide bridge shall support all waveguide and coaxial cables a minimum of 10 feet above the communications tower footings. Actual elevation shall be shown on the plans.

The waveguide bridge shall not exceed 20 feet in length. The waveguide bridge shall be level (± 4 inches).

The waveguide bridge shall be a complete system, with required anchor bolts, and pipe column kit parts.

Work Platform(s):

The communications tower shall contain work platforms located at the 50 foot and 100 foot elevations. Platform elevations may vary by 2 feet to suit tower equipment requirements.

The work platform shall consist of a level full coverage platform of steel grating designed to provide reasonable access to work areas.

The minimum area of each platform shall be 70 square feet or equal to the area enclosed by the tower at that elevation, whichever is greater.

Safety handrails shall be provided around the perimeter of the platform with the upper railing at 42 inches above the deck and the intermediate rail at 18 inches above the deck. All corners on railings shall be rounded.

Safety toe-rail shall be provided around the perimeter of the platform.

The tower diagonals may be used to support platform handrails.

Work platform shall be designed to support two concentrated live loads of 300 lbs each. Live loads imposed by persons on the platform shall be considered to concentrate at such points that will cause maximum stress in the structural members being considered.

COMMUNICATIONS TOWER ELECTRICAL REQUIREMENTS

Each work platform shall contain one electrical duplex outlet. The electrical duplex outlet shall be mounted 1 foot above the respective work platform deck.

The duplex outlet shall be a GFCI outlet in a weatherproof device box with cover. The ground wire shall be a 10 gauge copper green insulated wire installed from a ground point on the duplex outlet metallic frames to the equipment building ground bus bar at the electrical distribution point.

The communications tower work platform electrical duplex outlets shall be installed on a single circuit as a homerun circuit.

The circuit-breaker for the outlets shall be located in the communications equipment building.

All conduit from the equipment building to the work platform duplex outlets shall rigid steel conduit and fittings. All conduit for the FAA lightning protection shall be rigid steel conduit and fittings. All conductors shall conform to the provisions in Section 12-16, "Electrical," of these special provisions.

PART 3 - EXECUTION

ASSEMBLY, ERECTION AND INSTALLATION

Field Fabrication:

All materials shall be fabricated for a delivery sequence, which will expedite erection and minimize field handling of materials.

All materials shall be properly marked and match-marked for field assembly. Finished members shall be true to line, shall have square corners and smooth bends, and shall be free from twists, kinks, warps, dents, and open joints.

Dissimilar metals will not be allowed in contact with one another.

Inside and outside surfaces of all hot-dipped-galvanized steel shall be as specified in standards and methods listed elsewhere in this specification.

The Contractor shall not do correction of damage without the approval of the Engineer.

Field modifications including welding or burning of holes in members will not be allowed.

Erection:

The communication tower shall be assembled, erected and installed by the tower manufacturer or by an authorized representative of the manufacturer, using qualified workmen skilled in the installation of such towers. Assembly, erection and installation work shall be performed in accordance with the manufacturer's recommendations, TIA and EIA recommended procedures, and the approved working drawings.

The communication tower assembly shall include installing work platforms, antenna mounting structures, waveguide and coaxial cable support system, fixed ladder and mounting platform, ladder safety cable system, step bolts, waveguide bridge to the equipment building, ice shields, tower lightning protection, grounding system, and all other appurtenances necessary for the installation of said systems.

Grounding shall be in conformance with the tower manufacturer's recommendations.

Structural members shall be set accurately to lines and elevations indicated on the working drawings. The various members shall be aligned and adjusted forming each communication tower bay before permanent fastening.

Galvanized surfaces that are abraded or damaged shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating. The clean areas shall then be painted with 2 spot applications of a coating conforming to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) and listed on MPI List Number 18, Primer, Zinc Rich, Organic.

Painting: The tower shall be finish coated in accordance with the requirements specified for steel and other ferrous metals under "Painting" in Section 12-9, "Finishes," of these special provisions. Paint colors shall be in accordance with the requirements of the Federal Aviation Administration.

12-2.08 GUARD POSTS

PART 1 - GENERAL

Scope: This work shall consist of constructing guard posts in accordance with the details shown on the plans and these special provisions.

PART 2 - PRODUCTS

Steel Posts: Steel posts for guard posts shall be standard weight, galvanized steel pipe conforming to the details shown on the plans.

Concrete: Concrete for guard posts shall be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 470 pounds of cement per cubic yard.

PART 3 - EXECUTION

Installation:

The length and diameter of the guard posts shall conform to the details shown on the plans.

Guard posts shall be placed in holes excavated to the depth and cross section shown on the plans, and shall be installed plumb.

Guard posts shall be backfilled with concrete as shown on the plans.

Painting: Guard posts shall be prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-2.09 ACCESSIBLE PARKING AND AUTHORIZATION SIGNS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing accessible parking and authorization signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data: Manufacturer's descriptive data and sign fastening details shall be submitted for approval.

PART 2 - PRODUCTS

Accessible Parking Stall Identification Sign: Accessible parking stall identification sign shall be a reflective metal sign with baked enamel finish and the international symbol of accessibility. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Symbol, lettering and border shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Van Accessible Sign: Van accessible sign shall be a reflective metal sign with baked enamel finish and the international symbol of accessibility. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Lettering and border shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Unauthorized Vehicles Parking Sign: Unauthorized vehicles parking sign shall be a reflective metal sign with baked enamel finish. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Lettering and border shall be white and shall conform to Federal Standard 595B, Color No. 17886. Lettering shall be not less than one-inch in height and shall read as shown on the plans.

Support Post: Support post shall be commercial quality, standard weight, galvanized steel pipe. Pipe diameter shall be 1¾ inch.

Fastening Hardware: Fastening hardware shall be galvanized or cadmium plated.

Concrete: Concrete for support posts shall be commercial quality concrete, proportioned to provide a workable mix suitable for the intended use, with not less than 470 pounds of cement per cubic yard.

PART 3 - EXECUTION

Installation:

Support posts shall be placed in holes excavated to the depth and cross-section shown on the plans. Posts shall be set vertical and shall be firmly embedded in concrete backfill. The top of the concrete backfill around the post shall be crowned to drain water.

Support posts shall be fitted with a rainproof top.

Sign shall be fastened rigidly and securely to the support post.

The Engineer will provide the Contractor with the necessary information for unauthorized vehicles/parking area sign. This information shall become a permanent part of the sign.

12-2.10 SITE FURNISHINGS

PART 1 GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing and precast concrete bollards in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data: Manufacturer's product data sheets for each type of site furnishing and accessory. Include installation instructions, maintenance instructions, and general recommendations regarding each product.

1. Recycled Materials: A report of site furnishing parts consisting of recycled materials. Product specification data, providing test information for deflection and creep in accordance with ASTM D 648 and ASTM D 2990 for site furnishings which use plastic lumber as a component. The data shall provide a comparison of deflection and creep measurements to other comparable materials.

Assembly Instruction Drawings: Scaled drawings showing elevations and dimensions for each type of site furnishing. Indicate details of layout; spacings, sizes, shape and thicknesses of materials; and methods of mounting and anchoring.

Finishes: Provide data of manufacturer's standard color selections and finishes. Identifying colors and finishes proposed for use for each item of site furnishing.

Certificates:

1. Primer Certificate: Submit a certificate from the manufacturer stating that the primer conforms to the specified requirements.
2. Powder Coatings Certificate: Submit a certificate from the manufacturer stating that the powder coat conforms to the specified requirements.

Manufacturer's certificate of compliance.

QUALITY ASSURANCE

Manufacturer's Qualifications: Materials shall be the standard products of a manufacturer regularly engaged in the production of site furnishings. The materials provided shall be of a type with satisfactory performance for at least 2 years based on testing and field experience.

DELIVERY, INSPECTION, STORAGE AND PROTECTION

Deliver, handle, and store materials in accordance with the manufacturer's recommendations. Inspect delivered site furnishings upon arrival at the work site to confirm products conform to requirements.

Store items in designated area free from contact with soil and protected from weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

MATERIALS

Anchors and Hardware: Provided, where necessary, for fastening site furnishings securely in place and in accordance with approved manufacturer's instructions. Anchoring devices that may be used, when no anchors are otherwise specified or indicated, include anchor bolts, slotted inserts, expansion shields for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; and lag bolts and screws for wood.

1. Anchor bolts: ASTM A 307.
2. Threaded Inserts and Expansion Anchors: Provide inserts recessed not less than 2.5 inches into concrete or masonry. Pullout 198 pounds in concrete with f'c of 3,000 psi, as tested per ASTM E 488. Expansion shields shall conform to FS A-A-1925, group II, type 4, class 1. Provide embedment required by manufacturer.
3. Lag Screws and Bolts: ANSI B18.2.1, type and grade best suited for the purpose.
4. Toggle Bolts: ANSI B18.2.1.
5. Bolts, Nuts, Studs and Rivets: ASME B18.2.2 or ASTM A 307.
6. Power Driven Fasteners: Follow safety provisions of ANSI A10.3.
7. Screws: ANSI B18.2.1, ASME B18.6.2, and ASME B18.6.3.
8. Washers: Provide plain washers to conform to ASME B18.22M ASME B18.22.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.2M ASME B18.21.1.

BENCHES

Precast Units:

Design precast units in accordance with manufacturer's standards, size as indicated. Finish and color as indicated selected from manufacturer's standards.

1. Precast Concrete/Cast Stone Units: Provide reinforced precast concrete units consisting of a mixture of cement, aggregates and mineral colors suitable for exterior use at locations indicated.

    a. Design benches to sustain a live load of not less than 200 pounds per square foot.
    b. Portland cement: ASTM C 150 Type I II or III.
    c. Aggregate: ASTM C 33, maximum size 3/4 inch.
    d. Reinforcing steel: ASTM A 615/A 615M.
    e. Galvanized wire mesh: ASTM A 185.
    f. Integral color: ASTM C 979, pure mineral oxide, limeproof and non-fading.
    g. Provide minimum 5000 psi 28 day compressive strength concrete, maximum five percent absorption.
    h. Admixture: ASTM C 260 for air-entraining.

PRECAST CONCRETE BOLLARD

Materials:

Cement shall conform to the requirements of ASTM C-150, Type 1.

Aggregates shall conform to the requirements of ASTM C-33, and shall be cleaned of foreign matter and properly graded to size.

Surface finish:

The bollard shall have a smooth surface finish.

Color shall be natural concrete gray.

COLLAPSIBLE BOLLARDS

Performance Requirements:

Bolload will collapse down to 3.5" above finished ground surface.

Padlock Operated Unit: Unlock the padlock and remove the pin to allow the pivot point to rotate and the bollard to lie down. Reverse the sequence to return bollard to orginal and locked position.

References:

ASTM A53/A53M-04a Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated and Welded and Seamless.

ASTM A366 Standard Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Tubing in Rounds and Shapes.

PART 3 EXECUTION

EXAMINATION

Verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings.

INSTALLATION

Install site furnishings plumb and true, at locations indicated, in accordance with the approved manufacturer's instructions.

Assembly and Erection of Components: Items shall be shipped knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

Anchorage, Fastenings, and Connections:

Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening furniture or furnishings securely in place.

Provide, for anchorage not otherwise specified or indicated, slotted inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood.

Do not use wood plugs in any material.

Provide non-ferrous attachments for non-ferrous metal.

Make exposed fastenings of compatible materials, generally matching in color and finish the fastenings to which they are applied.

Conceal fastenings where practicable.

WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

TESTING

Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure:

1. Measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated.
2. Site furnishings which do not comply shall be reinstalled.
3. Fasteners and anchors determined to be non-compliant shall be replaced.
4. Provide a written report describing the results of the testing.

RESTORATION AND CLEAN UP

Following installation, clean up the work site and restore existing areas that have been damaged from the installation operation to original condition.

Clean and repair site furnishing surfaces of dirt, stains, filings, and other blemishes occurring from shipment and installation using agents. Cleaning methods and agents shall be according to manufacturer's instructions.

Protection: Protect site furnishing areas as required or directed by the Engineer with barricades and signage.

Disposal of Materials: Excess and waste material shall be removed and legally disposed off State property.

RE-INSTALLATION

Where re-installation is required: Re-install the product as specified. Material acquisition of replacement parts shall be the responsibility of the Contractor. Provide replacement materials that are new and supplied by the original manufacturer to match.

SECTION 12-3. CONCRETE AND REINFORCEMENT

12-3.01 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of constructing cast-in-place concrete facilities in accordance with the details shown on the plans and these special provisions.

Concrete:

Except for concrete designated by compressive strength, concrete shall conform to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications, and these special provisions.

Concrete designated by compressive strength shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications, and these special provisions.

Reinforcement: Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications, and these special provisions.

DEFINITIONS

Concrete Designated by Compressive Strength: Concrete with a compressive strength shown on the plans greater than 3,600 psi.

SUBMITTALS

Product Data:

Manufacturer's descriptive data, installation and use recommendations for admixtures, expansion joint material, vapor barrier, curing compound, hardener, and sealer shall be submitted for approval.

Descriptive data shall be delivered to the Engineer at the jobsite.

Concrete Mix Designs: Copies of concrete mix designs shall be submitted when required.

Certificates of Compliance: Certificates of compliance shall be submitted when required as informational submittals.

PART 2 - PRODUCTS

CONCRETE MIXES

The amount of cementitious material used per cubic yard of concrete for each building element shall conform to the following:

Type	Cementitious Material Content (Pounds/CY)
Concrete (Structural Work): Footings, foundation walls, floor slabs, building frame members, building walls	590 min.[a,]
Concrete (Sewer Structures): For sewer structures, vehicle washracks and mudrinse slabs	658 min.[b]
Concrete (Minor Work): For concrete curbs, sidewalks, driveways, gutter depressions, new door openings, and collars	505 min.

Notes:

[a]For concrete designated by compressive strength, the maximum amount of cementitious material shall be 800 pounds per cubic yard.

[b]Concrete shall be air entrained in conformance with the requirements in Section 90-4, "Admixtures," of the Standard Specifications. The air content at time of mixing and prior to placing shall be 6 ± 1½ percent.

In addition to the above requirements, concrete shall conform to "Freezing Condition Requirements" of these special provisions.

COLORED CONCRETE

The Contractor shall monitor the water content, weight of cementitious materials, and size, weight, and color of aggregate to maintain consistency and accuracy of the mixed colored concrete. The Contractor shall schedule delivery of concrete to provide consistent mix times from batching until discharge. No water shall be added after a portion of the batch has been discharged.

FORM MATERIALS

Forms for Exposed Finish Concrete:

Forms for exposed surfaces shall be plywood, metal or other panel type materials. Plywood shall be not less than 5/8 inch thick and without scars, dents, and delaminations. Forms shall be furnished in largest practical pieces to minimize number of joints.

Plywood shall conform to the requirements of U. S. Product Standard PS-1 for Exterior B-B (Concrete Form) Class I.

Forms for edges of slabs shall be nominal 2-inch solid stock lumber, plywood, or metal forms.

Forms for Unexposed Finish Concrete: Forms for unexposed finish concrete surfaces shall be plywood, lumber, metal or other acceptable material.

Forms for Cylindrical Columns or Supports: Forms for cylindrical columns shall be metal, fiberglass reinforced plastic, paper or fiber tubes. Paper or fiber tubes shall be constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for protection against weather or moisture.

Form Ties: Form ties shall be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

Form Oil: Form oil shall be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

REINFORCEMENT

Bar Reinforcement: Bar reinforcement shall conform to ASTM A 615/A 615M, Grade 60, or ASTM A 706/A 706M.

Bar Supports: Bar supports for reinforcement shall be precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads.

EPOXY

Epoxy shall be furnished as 2 components which shall be mixed together at the site of the work.

Epoxy Resin Adhesive: Epoxy resin adhesive shall conform to State of California Specification No. 8040-21M-08 or other epoxy suitable for bonding new concrete to old.

Epoxy Mortars: Epoxy mortar and epoxy mortar surface treatment shall consist of a commercial quality, trowelable mixture consisting of epoxy and sand. Epoxy shall have a pull-off strength of not less than 1,000 psi and a 90-percent cure in 24 hours. Epoxy shall be of the type that requires no primer as a bonding agent.

Sand:

Sand for use in epoxy mortars shall be clean and shall have a moisture content of not more than 0.50-percent when tested in accordance with California Test 226.

Sand for epoxy mortar surface treatment shall be graded such that 100-percent passes the No. 100 sieve.

RELATED MATERIALS

Anchor Bolts and Anchor Rods, Nuts and Washers:

Headed and Unheaded Anchor Bolts and Anchor Rods: Comply with ASTM F 1554. Use Grade 36 unless a higher grade is shown on the plans.

Nuts: Comply with ASTM A 563.

Washers:

1. Washers bearing on wood surfaces must be commercial quality.
2. Washers bearing on steel surfaces must comply with ASTM F 436, Type 1.
3. Plate washers must comply with ASTM A 36/A 36M.

Exposed anchor bolts and anchor rods, nuts and washers must be hot-dipped galvanized.

Expansion Joint Material: Expansion joint material shall be commercial quality asphalt impregnated pressed fiber sheets, ½-inch minimum thickness.

Vapor Barrier: Vapor barrier shall be not less than 15 mils thick and shall conform to the requirements of ASTM E 1745, Grade A. Tape for overlapped seams shall be as recommended by the manufacturer of the vapor barrier.

Bond Breaker: Bond breaker shall be Type I asphalt saturated organic felt or such other material approved by the Engineer.

Nonskid Abrasive Aggregate: Nonskid abrasive aggregate shall be commercial quality aluminum oxide, silicon carbide, or almandite garnet grit particles; screen size 12-30 or 14-36.

Type A Control Joints: Type A control joints shall be commercial quality, preformed, T-shaped plastic strips with detachable top flange.

Keyed Construction Joint Forms: Keyed construction joint forms shall be commercial quality, galvanized metal or plastic, factory fabricated construction joint forms. Forms shall produce a rabbeted key type joint.

Divider and Edger Strips: Divider and edger strips shall be foundation grade redwood.

Mortar: Mortar shall consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

Curing Compound: Curing compound shall be a non-pigmented curing compound with fugitive dye conforming to the requirements of ASTM C 309, Type 1-D, Class A.

Concrete Hardener: Concrete hardener shall be commercial quality water borne penetrating type magnesium fluosilicate, zinc fluosilicate or combination thereof.

Concrete Sealer: Concrete sealer shall be commercial quality VOC-compliant, silane type sealer with hydrophobic and oleophobic properties.

Splash Block: Splash blocks shall be precast concrete splash blocks with depressed runoff trough. Splash blocks shall be 12" x 24" x 3½" in size unless otherwise shown on the plans.

Nonshrink Grout:

Nonshrink grout shall be metallic for concealed areas, nonmetallic for exposed areas.

Grout shall be factory packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; free of oxidizing catalysts and inorganic accelerators, used as dry or damp pack, or mixed to a 20-second flow (CRD C621), without segregation or bleeding at any temperature between 45 deg F and 90 deg F.

Working time of grout shall be 30 minutes or more.

PART 3 - EXECUTION

PREPARATION

Existing Concrete Construction:

Where fresh concrete joins existing or previously placed concrete or masonry, the contact surfaces of the existing or previously placed material shall be roughened, cleaned, flushed with water and allowed to dry to a surface dry condition immediately prior to placing the fresh concrete. The roughened surface shall be no smoother than a wood trowelled surface. Cleaning of the contact surfaces shall remove laitance, curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods shall be used to clean horizontal construction joints to the extent that clean aggregate is exposed.

Exposed reinforcing steel located at the contact surfaces which is to be encased in the fresh concrete shall be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

Forms:

Forms shall be mortar tight, true to the dimensions, lines, and grades shown on the plans, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces shall be constructed with triangular fillets not less than 3/4" x 3/4" attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners shall be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties shall be removed to a depth of at least one inch below the surface of the concrete.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms shall be thoroughly coated with form oil prior to use.

Forms shall not be stripped until at least 40 hours after placing concrete, except soffit forms and supports shall not be released or removed until at least 10 days after placing concrete.

Anchorages and embedded items shall be placed and rigidly secured at their planned locations prior to placing concrete.

Reglets or embedded flashing shall be installed on concrete forms before the concrete is placed.

Redwood dividers shall have 16d galvanized nails partially driven into both vertical faces at 18 inches on center.

Vapor Barrier:

Vapor barrier shall be installed in conformance with the manufacturers recommendations and shall be protected with a 3-inch layer of clean uncompacted sand cover.

Unless otherwise shown on the plans, vapor barrier shall be placed under portions of the floor slab scheduled to receive finish flooring.

Placing Reinforcement:

Set wire ties with ends directed into concrete, away from exposed concrete surfaces.

Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

Ground Bar: A continuous reinforcing steel bar shall be installed in the building foundation at the location indicated on the plans for the electrical ground bar. The use of epoxy coated reinforcing bar is not permitted. The end of the ground bar shall extend beyond the concrete surface and shall be protected from damage by construction operations.

Hydronic Tubing:

Hydronic tubing shall be securely fastened to the bar reinforcing using nylon ties.

The hydronic heating system shall be fully tested prior to placing concrete.

PLACING CONCRETE

Concrete shall be placed in conformance with the provisions in Section 51-1.09, "Placing Concrete," of the Standard Specifications, and these special provisions.

Concrete shall be deposited and consolidated in a continuous operation within limits of construction joints, until the placing of the panel or section is completed.

When concrete is to be placed in large areas requiring more than two pours, concrete shall be placed in alternate long strips between construction joints and the final slab infilled.

FINISHING CONCRETE SURFACES

Finishing Unformed Surfaces:

Slabs shall be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds shall be set to grade at approximately 6-foot centers. After leveling, screeds shall be removed and the surface shall be floated with wooden floats.

Type A control joint strips shall be inserted into the floated concrete so that the bottom of the top flange is flush with the finish elevation. Strips shall be standard manufactured lengths and shall be placed on an approximate straight line. The top flange of the strips shall be removed after the concrete has set and cured.

The floated surface shall be trowelled with steel trowels. Troweling shall form a dense, smooth and true finish. Walkways, pedestrian ramps, stairs and outdoor slabs for pedestrian traffic shall be given a non-slip broom finish unless a different finish is called for on the plans or in these special provisions.

The application of cement dust coat will not be permitted.

Steel trowel finish and broom finish will not be required for slabs to receive exposed aggregate finish nor for slabs to be covered with ceramic tile.

Concrete floor surfaces to receive ceramic tile shall be floated to grade and then, before final set of the concrete, the floated surfaces shall be roughened with stiff bristled brushes or rakes.

Finished surfaces of floor slabs shall not deviate more than 1/8 inch from the lower edge of a 10-foot long straight edge.

Finishing Formed Surfaces:

Formed concrete surfaces shall be finished by filling holes or depressions in the surface, repairing all rock pockets, and removing fins. All surfaces of formed concrete exposed to view shall have stains and discolorations removed, unsightly bulges removed, and all areas which do not exhibit the required smooth, even surface of uniform texture and appearance shall be sanded with power sanders or other approved abrasive means until smooth, even surfaces of uniform texture and appearance are obtained.

Cement mortar, patching and finishing materials used to finish exposed surfaces of concrete shall closely match the color of surrounding surfaces.

Nonskid Abrasive Aggregate Finish: Where shown on the plans, walkways shall receive a nonskid abrasive aggregate (grit) finish. The grit shall be applied uniformly at the rate of not less than 0.3 pound per square foot and tamped into the floated concrete surface while the concrete is plastic. The grit shall be buried about 0.7 diameter of each particle into the concrete.

CURING CONCRETE

Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperatures.

Initial curing of floor slabs shall start as soon as free water has disappeared from the concrete surface. The concrete shall be kept continuously wet by application of water for not less than 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or sand blankets may be used as a curing medium to retain the moisture during the curing period. Curing materials that will stain or discolor concrete shall not be used on surfaces exposed to view.

Prior to placing the curing medium, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.

Concrete surfaces, other than floor slabs, shall be kept moist for a period of at least 5 days by leaving the forms in place or by covering the exposed surfaces using moist rugs, cotton mats or other curing materials approved by the Engineer.

Concrete curbs, sidewalks, collars, and gutter depressions may be cured with a curing compound.

PROTECTING CONCRETE

Vehicles, equipment, or concentrated loads weighing more than 300 pounds individually and material stockpiles weighing more than 50 pounds per square foot will not be permitted on the concrete within 10 calendar days after placing.

SPECIAL TREATMENTS

Concrete Hardener:

Chemical concrete hardener shall be applied to the floor surfaces shown on the plans, prior to the application of concrete sealer. Surfaces shall be clean and dry before the application of hardener.

The solution shall be applied in accordance with the manufacturer's instructions.

After the hardener has dried, the surface shall be mopped with water to remove encrusted salts.

Concrete Sealer: Concrete sealer shall be applied to the concrete surfaces designated on the plans in accordance with the manufacturer's instructions for heavy duty use. The sealer shall be applied to dry concrete surfaces.

Epoxy Resin Adhesive: Epoxy resin adhesive shall be applied to concrete surfaces shown on the plans. Epoxy resin adhesive shall be mixed and applied in accordance with the manufacturer's recommendations.

Epoxy Mortars:

Epoxy for use as a binder in epoxy mortars shall be thoroughly mixed together before the aggregate is added, and unless otherwise specified, the mix proportions shall consist of one part binder to approximately 4 parts of aggregate, by volume.

All surfaces against which epoxy mortars are to be applied shall be free of rust, paint, grease, asphalt, and loose or deleterious material.

12-3.02 ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of constructing and erecting precast concrete caps at low masonry walls, drywell, and precast sills in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Working Drawings:

Complete working drawings showing dimensions, location of cast items, reinforcement, and other pertinent information shall be submitted for approval.

Working drawings shall also include a location plan which shows the location and identification of each Architectural precast concrete element.

QUALITY ASSURANCE

Codes and Standards: Welds shall conform to the requirements in AWS D1.1, "Structural Welding Code - Steel," for steel shapes and AWS D1.4, "Structural Welding Code - Reinforcing Steel," for bar reinforcing steel.

Fabricate and erect precast concrete members within tolerances recommended in PCI MNL 117.

Submit control samples to Engineer for approval.

PART 2 - PRODUCTS

Wall caps
Bench top
Watertable

MATERIALS

Architectural Precast Concrete products shall conform to the requirements of structural work under "Cast-in-Place Concrete" in Section 12-3 "Concrete and Reinforcement" of these special provisions.

Substitute Provide white Portland cement and crushed white aggregate where required to achieve colored concrete matching the approved control sample.

FABRICATION

Manufacture precast concrete units in accordance with PCI MNL-117, PCI "Architectural Precast Concrete," and applicable requirements of ACI 318/318R, Chapter 16. Forms shall be accurately constructed to produce members to dimension, shape, configuration, and profile indicated. When not otherwise indicated, construct forms to produce smooth concrete. Members shall be moist cured in accordance with curing requirements specified in PCI MNL-117. Provide finishes for exposed concrete matching approved samples and mock-ups and the approved control samples.

PART 3 - EXECUTION

ERECTION AND INSTALLATION

The requirements of this special provision are in addition to the applicable requirements for concrete (structural work) and bar reinforcing steel in "Cast-in-Place Concrete," elsewhere in this Section 12-3.

Transport and erect precast members in accordance with PCI MNL-117.

Erection:

Precast concrete units shall not be erected until at least 75 percent of the design strength shown on the plans has been attained and verified by the Contractor.

Provide anchorage and attachment as indicated in accordance with PCI MNL-117 Division VI. Provide touch up painting of field welds and abraded surfaces.

At completion, units shall be plumb, level, and square, true to line, with edges and angles parallel with related building lines.

Welding: Panels shall be welded to supports as shown on the plans.

PATCHING

Holes in panels caused by lifting and bracing devices shall be patched as specified for other concrete work.

FIELD QUALITY CONTROL

Testing: Concrete strength at the time of lifting shall be verified with tests conducted by the Contractor.

SECTION 12-4. MASONRY

12-4.01 CONCRETE MASONRY UNITS

PART 1 - GENERAL

SUMMARY

This work includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Bar reinforcement.
4. Ties and anchors.

RELATED WORK

Water Repellent Coating: Comply with Section 12-7, "Water Repellent Coating."

Prefaced Masonry Units: Comply with Section 12-4 "Prefaced Masonry Units."

DEFINITIONS

CMU: Concrete masonry unit.

PERFORMANCE REQUIREMENTS

Masonry Compressive Strength: Provide masonry that develops the compressive strength (f'm) shown on the plans at 28 days.

SUBMITTALS

Product Data: Submit manufacturer's descriptive data for each type of masonry unit, accessory, and manufactured product.

Samples: Submit 2 sample CMUs for each color and architectural finish.

Grout Mix Design: Submit a grout mix design for each grout mix proposed for use. Submit a revised grout mix design for any proposed change to the proportions of an approved grout mix.

Working Drawings: Submit calculations and working drawings for temporary supports of masonry lintels. Design and construct temporary supports to provide the necessary rigidity and to support loads which will be applied. Design calculations and working drawings must be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration must be shown.

Qualification Data: Submit qualification data for proposed testing laboratory.

Field Quality Control Plan:

Submit a written Field Quality Control Plan that identifies the inspector, the testing laboratory, and the procedures to be used. The plan must conform to these specifications and the CBC.

Designate a Masonry Quality Control Manager (MQCM) in the Field Quality Control Plan. The MQCM must be directly responsible to you for the quality of masonry, including materials and workmanship, performed by you and your subcontractors.

The MQCM must be the sole individual responsible to you for submitting, receiving, and approving all correspondence, required submittals, and reports to and from the Engineer.

The MQCM must not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The MQCM may be your employee.

QUALITY CONTROL AND ASSURANCE

Masonry Preconstruction Testing:

Employ and pay all costs for the services of a testing laboratory experienced in performing preconstruction masonry tests.

The testing laboratory must comply with ASTM E 329.

Perform preconstruction testing to determine masonry compressive strength for each grout mix to be used under one of the following CBC test methods:

1. Section 2105.2.2.1, "Unit strength method," except the grout must meet the requirements under Section 2105.2.2.1.2, "Concrete Masonry," 3.3.2.
2. Section 2105.2.2.2, "Prism test method." The grout compressive strength must also be tested under ASTM C 1019 and be equal to or greater than the masonry compressive strength, but not less than 2,000 psi.

The grout compressive strength at 28 days must be 85 percent or more of the minimum required grout compressive strength.

The testing laboratory must report test results in writing to the Engineer and you, on the same day the tests are made.

Do not perform masonry work until the required masonry and grout compressive strengths are attained.

Single Source Responsibility:

For each product required, obtain exposed CMUs of a uniform color and architectural finish from a single source and from a single manufacturer.

Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from a single source or producer for each aggregate.

Certificates of Compliance: Furnish a Certificate of Compliance for CMUs, aggregate for grout, and ready-mixed grout under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE, AND HANDLING

Delivery: Deliver masonry materials to the project in an undamaged condition.

Storage:

Store CMUs on elevated platforms in a dry location. If CMUs are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If CMUs become wet, do not install until they are dry.

Store cementitious materials on elevated platforms and in a dry location. Do not use cementitious materials that have become damp.

Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

Handling: Prevent damage, contamination, corrosion, or other deterioration to masonry materials when handling.

PROJECT CONDITIONS

Protection of Masonry: Cover partially completed masonry, tops of walls, projections, and sills with waterproof sheeting when construction is not in progress.

Stain Prevention:

1. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
2. Protect the base of walls from rain-splashed mud and from mortar splatter by spreading coverings on the ground and over wall surfaces.
3. Protect sills, ledges, and projections from mortar droppings. Protect surfaces of window and door frames, and other similar products with painted and integral finishes, from mortar droppings.

PART 2 - PRODUCTS

CONCRETE MASONRY UNITS

Concrete Masonry Units:

Provide CMUs of nominal size, color, and architectural finish as shown on plans. Provide hollow, load bearing, light normal weight or medium weight, open-ended CMUs that comply with ASTM C 90.

Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

MASONRY LINTELS

Masonry Lintels: Construct built-in-place masonry lintels from bond beam CMUs, with reinforcing bars placed as shown on the plans.

MORTAR AND GROUT MATERIALS

Mortar Materials:

Mortar: Comply with ASTM C 270.

Cement: Comply with ASTM C 150, Type II, low alkali portland cement.

Lime: Comply with ASTM C 207, Type S.

Aggregate: Comply with ASTM C 144, with maximum 10 percent passing the No. 100 sieve.

Coloring for Mortar: Chemically inert, fade resistant mineral oxide or synthetic type.

Premixed Mortar: A premixed packaged blend containing only cement, lime, and sand, with or without color, that requires only water to prepare for use as masonry mortar. Packages of premix must bear the manufacturer's name, brand, contents, weight, and color identification.

Grout Materials:

Grout must comply with ASTM C 476, coarse grout, except for grout proportions. Grout proportions must comply with "Grout Mixes" under "Mortar and Grout Mixes."

Cementitious material must comply with Section 90-2.01C, "Required Use Of Supplementary Cementitious Materials," of the Standard Specifications and include one of the following:

1. Cement complying with ASTM C 150, Type II, and supplementary cementitious material.
2. Blended hydraulic cement complying with ASTM C 595, Type IP (MS).

Aggregate: Comply with ASTM C 404, except 100 percent of the coarse aggregate must pass the 3/8-inch sieve. Soundness loss must not exceed 10 percent when tested under California Test 214.

REINFORCEMENT

Bar Reinforcement: Comply with ASTM A 615/A 615 M, Grade 60, or ASTM A 706/A 706 M.

TIES AND ANCHORS

Anchors, Ties, Angles, and Metal Lath: Commercial quality and galvanized.

Anchor Bolts and Anchor Rods, Nuts and Washers:

Headed and Unheaded Anchor Bolts and Anchor rods: Conform to ASTM F 1554. Use Grade 36 unless a higher grade is shown on the plans.

Nuts: Conform to ASTM A 563.

Washers: Conform to ASTM F 436.

MORTAR AND GROUT MIXES

Dry Pack Mortar: One part portland cement to not over 3 parts of clean sand, mixed with a minimum amount of water for hydration and packing.

Mortar Mix: Proportion by loose volume with one part cement, ¼ to ½ part hydrated lime, and 2¼ to 3 parts aggregate. Tint with coloring to match the masonry units.

Premixed Mortar: Packages of premixed mortar must consist of one part cement, ¼ to ½ part hydrated lime, and 2¼ to 3 parts aggregate, and no other ingredients.

Grout Mixes:

Grout proportions must be determined by one of the following methods:

1. Proportioned by volume complying with ASTM C 476, Table 1.
2. Specified compressive strength complying with "Grout Mix Design" under "Submittals."

Mix with sufficient water to produce a mix consistency suitable for pumping without segregation. Provide grout with a slump of 8 to 11 inches.

Nonshrink Grout: Conform to ASTM C 1107, match color with the mortar.

Aggregate: Measure in a damp, loose condition.

PART 3 - EXECUTION

INSTALLATION

Construction: Comply with Section 2104, "Construction," of the CBC. Comply with tolerances specified in Section 2104 unless otherwise shown on the plans.

Lay masonry units in running bond, unless otherwise shown on the plans.

Roughen, clean, and lightly wet the contact surfaces of existing material where fresh masonry joins concrete or masonry. The roughened surface must be at least as rough as a wood troweled surface. Remove laitance, curing compounds, debris, dirt, and any substance which decreases bond to the fresh masonry.

Erect masonry only when the ambient air temperature is above 40°F.

If masonry is erected when the ambient air temperature exceeds 100°F, keep surfaces of masonry moist with water for a minimum of 24 hours. Uniformly apply water with a fog spray at time intervals required to keep the surfaces moist, but not to exceed 3 hours between applications.

Firmly secure anchors, bolts, dowels, reglets, and other miscellaneous items to be cast into the wall in place before grout is poured.

Laying Masonry Units:

1. Lay CMUs dry.
2. Keep cells dry during laying of units in inclement weather by covering incomplete walls. Do not use wooden boards and planks as covering materials. Extend covering down each side of masonry walls approximately 2 feet.
3. Keep chases free from debris and mortar.
4. Use bond beam units with an opening at each cross web at horizontal reinforcing bars.
5. Make cuts with a masonry saw to neat and true lines. Do not use blocks with excessive cracking or chipping of the finished surfaces exposed to view.
6. Leave openings to inset outlet boxes, access control keypads, intrusion detection sensors, and similar components in to masonry, with concealed wiring.

Bar Reinforcement:

Position bar reinforcement as shown on the plans and securely hold in position with either wire ties or spacing devices near the ends of bars and at intervals not exceeding 192 bar diameters. Wire must be 16-gage or heavier. Do not use wooden, aluminum, or plastic spacing devices. Tolerances for the placement of vertical reinforcement in walls and flexural elements must be ± ½ inch. Tolerances for longitudinal reinforcement in walls must be ± 2 inches.

The minimum spacing for splices in vertical reinforcement for masonry walls must be 4 feet plus lap.

Do not place bar reinforcement in the plane of mortar joints.

Mortar:

Mortar joints must be approximately 3/8 inch thick. Lay units with all head and bed joints filled solidly with mortar for the full width of masonry unit shell. Shove head joints tight. Exposed joints must be concave and tooled smooth, unless otherwise shown on the plans.

Mortar that has been mixed more than one hour must not be retempered.

Preserve the unobstructed vertical continuity of the grout during mortar placement in joints. Any overhanging mortar projecting more than ½ inch, or other obstruction or debris must be removed from the inside of cells.

Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application as shown on the plans.

Remove splashes, stains, and spots on the faces of the masonry exposed to view.

LINTELS

Lintels: Temporarily support formed-in-place lintels for a minimum of 15 days after the wall has been completed.

GROUTING

Place CMUs full height of the masonry wall before grouting, or place CMUs full height of the grout pour before grouting.

For grout pours over 5 feet in height, provide cleanouts in the bottom course at every cell containing vertical reinforcement, at a maximum spacing of 32 inches. Each cleanout must be a minimum of 3 inches square. After cell inspection, seal cleanouts before filling with grout.

Place grout in a continuous pour in grout lifts. Grout lifts must not exceed 5 feet. The interruption between placing successive grout lifts must be not more than one hour. If the interruption is more than one hour, another grout pour must be used.

Solidly fill cells with grout. For each grout lift, consolidate grout in the cells at the time of placement by vibrating and reconsolidated after excess moisture has been absorbed but before plasticity is lost.

Between grout pours, form a horizontal construction joint by stopping the grout a minimum of 1½ inches below the top of the last course, except if the joint is at a bond beam, the joint must be ½ inch below the top of the bond beam unit or at the top of the wall.

FIELD QUALITY CONTROL

Testing:

Perform testing of masonry for every 5,000 square feet of CMU wall area, or portion thereof.

Determine masonry compressive strength under "Masonry Preconstruction Testing" under "Quality Control and Assurance."

Any work not meeting the requirements of Section 2105, "Quality Assurance," of the CBC, must be redone and retested. Sampling, inspecting, reworking, and retesting of material will be done at your expense.

REPAIRS AND PROTECTION

Remove and replace CMUs that are loose, chipped, broken, stained, do not match adjoining units, or are otherwise damaged. Install new units in fresh mortar to match adjoining units, and point joints to eliminate evidence of replacement.

Protect completed masonry from freezing for a period of at least 5 days.

SECTION 12-5. METALS

12-5.01 STRUCTURAL STEEL FOR BUILDINGS

PART 1 - GENERAL

SUMMARY

This work includes fabricating, assembling, furnishing, and erecting structural steel.

DEFINITIONS

Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on the plans.

Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1 1/2 inches
2. Welded built-up members with plates thicker than 2 inches
3. Column base plates thicker than 2 inches

RCSC: The Research Council on Structural Connections.

Seismic-Load-Resisting System (SLRS): Elements of structural-steel frame designated as SLRS or along grid lines designated as SLRS on plans, including columns, beams, and braces and their connections.

Structural Steel: Elements of the structural steel frame essential to support the design loads, including the following:

1. Anchor Rods.
2. Base Plates.
3. Beams including built-up beam, if made if made from standard structural shapes and plates.
4. Bearing Plates.
5. Bracing.
6. Columns.
7. Connection materials for framing structural steel to structural steel.
8 Crane stops, if made from standard structural shapes and/or plates.
9. Door frames if made from standard structural shapes and/or plates and if part of structural steel frame.
10. Edge angles and plates, if attached to the structural steel frame or steel (open web) joist.
11. Embeded structural steel parts, other than bearing plates that will receive structural steel.
12. Fasteners for connecting structural steel items: permanent shoop bolts, nuts and washers; fir shioment; field bolts, nuts and washers for permanent connections; and, permanent pins.
13 Floor-opening frame, if made from standard structural shapes and/or plates and attached to the structural steel frames.
14. Floor plates (checkered or plain), if attached to the structural steel frame.
15. Girders.
16, Hangers, if made from Standard Structural Shapes, plates and/or rods and framing structural steel to structural steel.

17. Leveling nuts and washers.
18. Leveling plates.
19. Leveling Screws.
20. Lintels, if attached to the structural steel frame.
21. Marquee framing, if made from standard structural shapes and/or plates.

SUBMITTALS

Product Data: Submit product data for items to be incorporated into the work, including structural steel, high strength fastener assemblies, and alternative connectors.

Working Drawings:

Submit working drawings that include the following:

1. A comprehensive list of all structural steel elements to be used as described under AISC 303, Section 2.1, "Definition of Structural Steel."
2. Sequence of shop and field assembly and erection, welding sequence and procedures, and welding nondestructive testing (NDT) sequence and procedures.
3. Identification of welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Location of butt welded splices on a layout drawing of the entire structure.
5. Location and details of any temporary supports that are to be used.
6. Type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted connections.
7. Identification of members and connections of the seismic-load-resisting system.
8. Identification of locations and dimensions of protected zones.
9. Identification of demand critical welds.
10. Any changes proposed in the work, details of connections and joints exposed to the weather, and details for connections not dimensioned on the plans. If changes are proposed or connections are designed, submit design calculations stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration must be shown.

Working Drawings for Falsework: Submit working drawings and calculations for falsework for use during the erection of structural steel. Design and construct the falsework to provide the necessary rigidity, and to support the applied loads. Working drawings and design calculations must be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration must be shown.

Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Submit WPSs and PQRs under AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

Qualification Data: Submit fabricator and welder qualifications.

QUALITY CONTROL AND ASSURANCE

Fabricate, assemble, and erect structural steel under AISC 303, 325, 341, and 360.

Welding: Weld under AWS D1.1/D1.1M and AWS D1.8/D1.8M, and comply with Section 8-3, "Welding."

Welding Qualifications:

Qualify procedures and personnel under AWS D1.1/D1.1M.

Welders and welding operators performing work on bottom-flange, demand-critical welds must pass the supplemental welder qualification testing, under AWS D1.8/D1.8M. FCAW-S and FCAW-G must be considered separate processes for welding personnel qualification.

Certificates of Compliance: Furnish a Certificate of Compliance for structural steel products under Section 6-1.07, "Certificates of Compliance." Include mill test certificates for each heat number of steel used in the work.

Final Drawings:

At the completion of each structural steel building, furnish one set of reduced prints on 60-pound (minimum) bond paper, 11 inches x 17 inches, of the corrected original tracings of all approved working drawings for each building. Include an index prepared specifically for the drawings for each building containing sheet numbers and titles on the first reduced print in the set for each building. Arrange reduced prints for each building in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image must be clearly visible and visually parallel with the edges of the page. Provide a clear, legible symbol on the upper left side of each page to show the amount of reduction, and provide a horizontal and vertical scale on each reduced print to facilitate enlargement to original scale.

DELIVERY, STORAGE, AND HANDLING

Load, transport, unload, and store structural materials so they are kept clean and undamaged. Store materials to permit access for inspection and identification.

Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Provide covers for protection of materials.

PART 2 - PRODUCTS

MATERIALS

Steel Bars, Plates, Channels, Angles, and Shapes (other than W-shapes): For each yield stress shown on the plans, comply with the following:

1. ASTM A 36/A 36M, when minimum yield stress is 36 ksi.
2. ASTM A 572/A 572M, Grade 50, when minimum yield stress is 50 ksi.

W-shapes: Comply with ASTM A 992/A 992M.

Pipe: Comply with ASTM A 53/A 53M, Grade B, standard weight, unless otherwise shown on the plans.

Hollow Structural Sections: For each yield stress shown on the plans, comply with the following:

1. ASTM A 501, when minimum yield stress is 36 ksi.
2. ASTM A 500/A 500M, Grade B, when minimum yield stress is 42 ksi for round shapes, and when minimum yield stress is 46 ksi for square and rectangular shapes.
3. ASTM A 500/A 500M, Grade C, when minimum yield stress is 46 ksi for round shapes, and when minimum yield stress is 50 ksi for square and rectangular shapes.

BOLTS, CONNECTORS, AND ANCHORS

Stud Connectors: Comply with ASTM A 108, AISI Grades 1018 through 1020, cold drawn, either semi- or fully kilned.

Anchor Bolts and Anchor Rods, Nuts and Washers:

Headed and Unheaded Anchor Bolts and Anchor Rods: Comply with ASTM F 1554. Use Grade 36 unless a higher grade is shown on the plans.

Nuts: Comply with ASTM A 563.

Washers:

1. Washers bearing on wood surfaces must be commercial quality.
2. Washers bearing on steel surfaces must comply with ASTM F 436, Type 1.
3. Plate washers must comply with ASTM A 36/A 36M.

Exposed anchor bolts and anchor rods, nuts and washers must be hot-dipped galvanized.

Machine Bolts, Nuts, and Washers:

Machine Bolts: Comply with ASTM A 307.

Nuts: Comply with ASTM A 563.

Washers: Commercial quality.

High Strength (HS) Fastener Assemblies:

HS Bolts: Comply with ASTM A 325 or A 490 when shown on the plans.

Nuts: Comply with ASTM A 563.

Washers: Comply with ASTM F 436, Type 1.

Direct Tension Indicators: Comply with ASTM F 959.

Tension Control Bolts: Comply with ASTM F 1852.

MORTAR

Mortar: Use one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

SHOP FABRICATION

Shop Fabrication and Assembly:

1. Cuts must not deviate more than 1/16 inch from the intended line. Remove roughness, notches, and gouges.
2. At points of loading, bearing stiffeners must be square with the web. At least 75 percent of the stiffener must be in contact with the flanges.
3. Finished members must be true to line and be free from twists, kinks, warps, dents, and open joints. Finished members must have square corners and smooth bends
4. Exposed edges and ends of metal must be dressed smooth, with no sharp edges, and with corners slightly rounded.
5. Mark and match-mark materials for field assembly.
6. Complete structural steel assemblies, including welding of units, before shop-priming operations.

Stud Connectors: Prepare steel surfaces as recommended by manufacturer of stud connectors. Use automatic end welding of stud connectors under AWS D1.1/D1.1M and manufacturer's instructions.

Connections:

1. Clean abutting surfaces at connections.
2. Do not cut or weld at the jobsite, except as shown on the approved working drawings or approved by the Engineer.
3. Cut, drill, or punch holes perpendicular to steel surfaces. Finished holes for bolts must be cylindrical. Sub-punch and sub-drill holes ¼ inch smaller in diameter than the diameter specified for the finished hole.

Bolted Connections:

Fabricate steel to steel bolted connections with machine bolts or HS fastener assemblies when shown on the plans.

Machine Bolts: Snug tighten.

HS Fastener Assemblies:

Assemble and install HS fastener assemblies under RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

Joint Type:

1. Snug tightened when no joint type is shown on the plans.
2. Pretensioned or slip critical when joint type is shown as such on the plans.

Galvanize HS fastener assemblies, or equivalent fasteners, by mechanically deposited coating process.

The bolt head type and head location must be consistent within a joint.

Install nuts on side of member least exposed to view.

Welded Connections: Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

Holes for Other Work: Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarged holes by burning. Drill holes in bearing plates.

SHOP FINISHES

Shop prime structural steel members, except those to receive sprayed-fireproofing.

Clean and coat steel surfaces of shop primed members under Section 12-9, "Painting."

HS Bolted Connections: Contact surfaces of HS bolted connections and ungalvanized anchorage assemblies must be coated before assembly. The total thickness of primer on each faying surface of slip-critical joints must be between 1 mil and the maximum allowable dry film thickness determined under the RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

SOURCE QUALITY CONTROL

Welded Connections: Test and inspect welded connections under AWS D1.1/D1.1M and the following:

Inspection:

1. Comply with AISC 341, Section Q5.2, except for CJP groove welds not receiving ultrasonic testing, perform magnetic particle testing on 100% of each root weld pass and each final weld pass of these welds.

2. Perform magnetic particle testing on 25% of each PJP groove weld. The Engineer will select the locations for testing. The cover pass must be ground smooth before testing.

Acceptance Criteria:

1. Ultrasonic Testing: Comply with AWS D1.1/D1.1M, Table 6.2 for statically loaded nontubular connections.
2. Magnetic Particle Testing: Comply with AWS D1.1/D1.1M, Clause 6, Part C.

Repairs:

1. If repairs are required, perform NDT on the repaired portion and re-inspect the weld by performing additional NDT on the entire length of the unrepaired portion of the weld under "Source Quality Control."
2. NDT of repaired work must be performed at your expense.

PART 3 - EXECUTION

ERECTION

Set structural steel accurately in locations and to elevations indicated.

Setting Bases and Bearing Plates:

Clean concrete and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

Set base plates and bearing plates for structural members on wedges or other adjusting devices.

Snug-tighten anchor bolts when no specific joint type is shown on the plans after supported members have been positioned and plumbed. Pretension anchor bolts when joints are shown as such on the plans after supported members have been positioned and plumbed. Do not remove wedges or shims except, if protruding, cut off flush with edge of plate before packing with mortar.

Solidly pack mortar between bearing surfaces and base or bearing plates so there are no voids. Neatly finish exposed surfaces and allow to cure.

Field Splices:

Field splices must be made only at the locations shown on approved working drawings or approved by the Engineer.

Accurately assemble parts in their final position as shown on the plans and in true alignment with related and adjoining work before final fastening.

Support parts to provide a vibration free, rigid, and secure installation.

FIELD CONNECTIONS

Assembly and installation of bolted connections must comply with "Bolted Connections" under "Shop Fabrication."

FIELD QUALITY CONTROL

Testing and inspection of field-welded connections must comply with "Welded Connections" under "Source Quality Control."

FIELD FINISHES

Touch-up Painting: After erection, clean field welds, bolted connections, and abraded areas of shop paint under SSPC-SP 2 or SSPC-SP 3. Apply one coat of the same coating as applied for shop painting to the cleaned areas.

After touch-up painting, coat all surfaces with a second prime coat, and finish coats when specified, to comply with Section 12-9, "Painting."

12-5.02 METAL DECK

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing metal deck in accordance with the details shown on the plans and these special provisions.

Metal deck includes ribbed sheet steel decking units, bent plates, accessories, fasteners and such other components, not mentioned, but required for a rigid, secure and complete installation.

REFERENCES

The design, fabrication and erection of metal deck shall conform to the applicable requirements of the American Iron and Steel Institute (AISI) publication, "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members," and the applicable Steel Deck Institute Design Manual and these special provisions.

Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

SUBMITTALS

Product Data: Manufacturer's descriptive data for each type of deck and accessories shall be submitted for approval.

Working Drawings: Working drawings showing complete erection layouts, details, dimensions, deck section properties shall be submitted for approval. Drawings shall show types and gages, fastening methods, including the location, type and sequence of connections, sump pans, cut openings, surface finishes and temporary supports or bracing.

The metal deck supplier shall submit a fastening schedule and calculations stamped by an engineer who is registered as a Civil or Structural Engineer in the State of California showing that the metal roof panels, clips, and fasteners conform to the span and design loads shown on the plans and the wind uplift requirements of the CBC.

QUALITY ASSURANCE

Qualification of Field Welding:

Welding processes and welding operators shall be qualified in accordance with "Welder Qualification," procedures in American Welding Society (AWS) D1.1, "Structural Welding Code - Steel."

Welding decking in place is subject to inspection and testing. Defective work shall be removed and replaced with acceptable work.

Certificates of Compliance: Certificates of Compliance shall be furnished for the metal decking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, HANDLING AND STORAGE

Metal deck units and accessories shall be transported, stored and erected in a manner that will prevent corrosion, distortion or other damage.

Deck units shall be stored off the ground with one end elevated to provide drainage.

PART 2 - PRODUCTS

Manufacturers: Acceptable manufacturers shall be; Verco Manufacturing Co.; BHP Co.; ASC Steel Deck, or equal.

MATERIALS

Deck Units:

Deck units, closures and plates shall be fabricated from galvanized sheet steel conforming to ASTM Designation: A 653/A 653M, Grade 33 [230].

Galvanizing shall conform to the requirements of ASTM Designation: A 924/A 924M, G60 [Z180].

Miscellaneous Steel Shapes: Miscellaneous steel shapes shall conform to ASTM Designation: A 36/A 36M.

Anchor Clips, Vent Clips, Flashing, Saddle Plates, Flexible Closure Strips and Other Accessories: Anchor clips, vent clips, flashing, saddle plates, flexible closure strips and other accessories shall be as recommended by the decking manufacturer.

FABRICATION

Deck units shall be formed to span 3 or more supports, with flush, telescoped or nested 2-inch laps at ends and interlocking or nested side laps unless otherwise shown on the plans.

Deck units shall conform to the configurations, metal thickness, depth and width and section properties shown on the plans.

End bearing shall be not less than 1½ inches.

Metal Closure Strips: Metal closure strips for opening between deck units and other construction shall be fabricated from the same gage and material as the adjacent deck units. Strips shall be formed to provide tight-fitting closures at end of cells or flutes and sides of decking.

Roof Sump Pans: Sump pans shall be fabricated from single piece of galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Sump pans shall be of adequate size to receive roof drains and with bearing flanges not less than 3 inches wide. Pans shall be recessed not less than 1½ inches below roof deck surface unless otherwise shown or required by deck configuration. Holes for drains shall be cut in the field.

Cleaning: When spray-on fireproofing is specified, the decking manufacturer shall supply decking free of amounts of oil or lubricants which would significantly impair the adhesion of the spray-on fireproofing.

PART 3 - EXECUTION

INSTALLATION

Deck units and accessories shall be installed in accordance with the manufacturer's recommendations and approved drawings and these special provisions.

Units shall be placed on supporting steel framework, adjusted in place and properly aligned before being permanently fastened. Ends of units shall have positive bearing over structural supports.

Cutting and fitting shall present a neat and true appearance with exposed burrs removed. Openings through the decking shall be cut square and shall be reinforced as recommended by the decking manufacturer.

The metal deck shall not be used as a working platform before deck units are fastened in place. Supplies, equipment or other loads shall not be stored on the deck. Mechanical equipment or other loads shall not be hung from metal roof decking.

Welding:

Welding shall conform to AWS requirements (D1.1 and D1.3) and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

Welding washers shall be used where recommended by the manufacturer.

Fastening Roof Deck Units: Roof deck units shall be fastened to supporting steel members as shown on the structural plans.

Fastening Side Laps: Side laps of adjacent deck units shall be fastened as shown on the plans. Deck shall be fastened to supporting members by welding or by screws as shown on the structural plans.

Roof Sump Pans: Roof sump pans shall be placed over openings provided in roof and welded to top decking surface. Welds are to be spaced at not more than 12 inches with at least one weld in each corner. Cut opening in sump bottom to accommodate drain size indicated.

Field Painting:

Immediately following erection, field welds, bolted connections and abraded areas shall be cleaned with a wire brush.

Galvanized surfaces shall be touched-up with galvanizing repair paint recommended by the manufacturer.

12-5.03 COLD FORMED METAL FRAMING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing cold formed metal framing, including load-bearing and non-bearing steel studs, and "C"-shaped steel joists and rafters, in accordance with the details shown on the plans and these special provisions.

SYSTEM DESCRIPTION

Loadings:

Components shall be sized to withstand the design loads shown on the plans.

Wall system shall be designed to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclical day/night temperature range.

Wall system design shall accommodate construction tolerance, deflection of building structural members, and clearances of intended openings.

REFERENCES

Component Design: Structural properties of studs and joists shall be computed in accordance with American Iron and Steel Institute (AISI), "Specification for Designing of Cold-Formed Steel Structural Members."

Welding:

Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel."

SUBMITTALS

Product Data:

Manufacturer's descriptive data and installation instructions for each item of cold-formed metal framing and accessories shall be submitted for approval.

Installation instructions shall include instructions for securing studs to tracks and other framing connections.

Working Drawings:

Working drawings and calculations for cold formed metal framing components not fully dimensioned in manufacturer's descriptive data shall be submitted for approval.

Working drawings shall include framing members showing size and gage designations, number, type, location and spacing. Working drawings shall include supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

The cold formed metal framing supplier shall submit drawings and calculations stamped by an Engineer who is registered as a Civil or Structural Engineer in the State of California showing that the metal framing and fasteners comply with seismic and wind uplift requirements of the CBC.

QUALITY ASSURANCE

Fire-rated Assemblies: Where cold formed metal framing units are components of assemblies indicated to be fire-rated, provide units which have been approved for the rating indicated on the plans.

DELIVERY, STORAGE AND HANDLING

Cold formed metal framing components shall be protected from rusting and damage. Components shall be delivered to the jobsite in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Components shall be stored off ground in a dry ventilated space.

PART 2 - PRODUCTS

COLD FORMED METAL FRAMING

Steel Studs, Joists and Rafters:

Load-bearing studs shall be formed to channel shape, punched web, and knurled faces, conforming to ASTM Designation: A 653/A 653M, Grade 50 [340]. Studs shall be 16-gage minimum thickness and size as shown on the drawings.

Joists, rafters, and other framing components, 18-gage or lighter, shall be fabricated of commercial quality galvanized steel sheets; conforming to ASTM Designation: A 653/A 653M, Grade 33 [230].

Steel Track: Track shall be formed steel, channel shape, and same width as studs; solid web; not less than 18-gage thickness.

ACCESSORIES

Fasteners: Fasteners shall be hot-dipped galvanized, self-drilling, self-tapping screws, or bolts, nuts and washers.

Anchorages: Anchorages shall be ICC approved for the purpose intended, integral stud type, powder driven or drilled expansion bolts.

FINISHES

Studs, Track and Headers: Studs, tracks and headers shall be hot-dipped galvanized to conform to ASTM Designation: A 653M, G60.

Miscellaneous Metal Parts: Miscellaneous parts, including, bracing, furring, plates, gussets, and bridging, shall be hot dipped galvanized to not less than 1¼ ounces per square foot.

FABRICATION

Cold formed metal framing components shall be fabricated in place or prefabricated into panels to the maximum extent possible prior to erection. Panels shall be fabricated plumb, square, true to line and braced against racking with joints welded. Lifting of prefabricated panels shall be performed in a manner to prevent damage or distortion.

Panels shall be fabricated in jig or templates to hold members in proper alignment and position to assure accurate placement.

Fastenings: Components shall be fastened by shop welding, bolting or screw fasteners as shown on the approved drawings.

PART 3 - EXECUTION

INSTALLATION

Studs:

Studs shall be erected plumb, except as needed for diagonal bracing or similar requirements. Channel tracks shall be aligned accurately to the wall layout at both floor and ceiling. Tracks shall be secured to floor and ceiling with fasteners spaced at not more than 16-inch intervals. Fasteners shall be provided at corners and ends of track.

Studs shall extend from floor to underside of ceiling except at wall openings. Each stud shall be secured to tracks at both top and bottom by bolting or screw fastening at both inside and outside flanges. Field welding shall not be permitted. A ½-inch clearance shall be provided at the top shoes. Door openings shall have double studs continuous across head and from floor to ceiling on each jamb.

Studs at openings shall be fastened solidly and securely to floor clips. Floor clips shall be fastened to the floor with 2 anchors unless otherwise shown on the plans.

Supplemental framing, blocking and bracing shall be installed in steel stud system wherever walls or partitions are to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition.

One continuous, horizontal ¾-inch channel reinforcement shall be placed approximately 6 inches above all wall openings. The reinforcement shall pass through the web openings in the studs and shall extend through the first stud located beyond the double studs at either side of the opening and shall be saddle tied to each stud it passes through.

Joists and Rafters:

Joists and rafters shall be installed directly over bearing studs or a load distribution member shall be installed at the top track.

Web stiffeners shall be provided at reaction points where shown on the plans.

Ends of joists shall be reinforced with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by the manufacturer.

Joists shall be secured to interior support systems to prevent lateral movement of bottom flanges

12-5.04 BUILDING MISCELLANEOUS METAL

PART 1 - GENERAL

Scope: This work shall consist of fabricating, furnishing, and installing building miscellaneous metal in accordance with the details shown on the plans and these special provisions.

Building miscellaneous metal shall consist of the following:

Drainage grates, steel gates, and access ladder fabrications.

Metal shapes required for general construction and not specified in other sections of special provisions.

All anchors, fastenings, hardware, accessories, and other supplementary parts necessary to complete the work.

REFERENCES

Codes and Standards: Welding of steel shall be in accordance with American Welding Society (AWS) D 1.1, "Structural Welding Code - Steel" and D 1.3, "Structural Welding Code - Sheet Steel."

SUBMITTALS

Product Data: Submit manufacturer's specifications, anchor details, and installation instructions for products used in miscellaneous metal fabrications.

Working Drawings: Working drawings of fabricated items shall be submitted for approval.

QUALITY ASSURANCE

Shop Assembly: Preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark all units for reassembly and installation.

Inspection and Tests: Materials and fabrication procedures shall be subject to inspection and tests by the Engineer, in mill, shop, and field. Such tests will not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

PART 2 - PRODUCTS

MATERIALS

Steel Bars, Plates, and Hot-rolled Shapes: Steel bars, plates, and hot-rolled shapes shall conform to ASTM A 36/A 36M.

Galvanized Sheet Steel: Galvanized sheet steel shall conform to ASTM A 653/A 653M, Grade 33. Galvanizing shall be G60.

Checkered Floor Plates: Checkered floor plates shall be commercial quality steel with standard raised pattern.

Pipe: Pipe shall be commercial quality standard steel pipe.

Hollow Structural Sections: Hollow structural sections shall conform to ASTM A 500/A 500M, Grade B.

Bolts, Studs, Threaded Rods, Nuts, and Washers:

Bolts, studs, and threaded rods for general application shall conform to ASTM A 307 or F 1554, Grade 36.

Nuts shall conform to ASTM A 563.

Washers bearing on wood surfaces shall be commercial quality. Washers bearing on steel surfaces shall conform to ASTM F 844 or F 436.

Fittings: Brackets, bolt, threaded studs, nuts, washers, and other fittings for railings and handrailings shall be commercial quality pipe and fittings.

Expansion Anchors: Expansion anchors shall be ICC approved for the purpose intended, integral stud type anchor or internally threaded type with independent stud, hex nut, and washer.

Powder Driven Anchors: Powder driven anchors shall be plated, spring steel alloy drive pin or threaded stud type anchors for use in concrete or steel. Spring steel shall conform to ASTM A 227, Class 1. The diameter, length, and type of shank and the number and type of washer shall be as recommended by the manufacturer for the types and thickness of material being anchored or fastened.

Resin Capsule Anchors: Stud anchors for resin capsule anchors shall conform to ASTM A 307 or F 1554, Grade 36, threaded steel rod with hex nut and washer and sealed glass capsule or cartridge containing an adhesive composed of unsaturated polyester resin and benzol peroxide coated quartz sand. Resin capsule shall be Hilti; Molly; or equal.

Drainage Grates: Drainage grates shall be fabricated from steel bars as specified herein; ductile iron castings conforming to ASTM A 536, Grade 65-45-12; or carbon steel castings conforming to ASTM A 27, Grade 65-35.

Steel Ladders:

Design and construction of steel ladders shall comply with ANSI A14.3 unless otherwise indicated.

Siderails shall be continuous steel flat bars with eases edges.

Fit rungs in centerline of siderails, plug-weld and grind smooth on outer rail faces. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

Provide platform as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles.

Support each ladder with welded or bolted steel brackets.

Galvanize ladders, include brackets and fasteners.

Prime ladders, including brackets and fasteners, with zinc-rich primer.

Steel Ladder Safety Cages:

Design and construction of ladder safety cages shall comply with ANSI A14.3. unless otherwise indicated.

Primary Hoops: 1/4-by-4-inch

Secondary Intermediate Hoops: 1/4"-by-2-inch flat bar hoops.

Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.

Galvanize ladder safety cages, including brackets and fasteners.

Prime ladder safety cages, including brackets and fasteners, with zinc-rich primer.

Roof access ladder:

Design and construction of aluminum ladders shall comply with ANSI A14.3, unless otherwise indicated.

Siderails: Space siderails 16-inch apart unless otherwise indicated. Siderails should be continuous extruded-aluminum tubes, not less than 3/4-inch deep and not less than 1/8-inch thick.

Rungs: Rungs should be extruded-aluminum tubes, not less than 3/4-inch deep and not less than 1/8-inch thick, with ribbed tread surfaces. Fit rungs in center line of siderails, fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.

Provide platforms as indicated fabricated from pressure-locked alumunum bar grating, supported by extruded-aluminum framing. limit opening in grating to no more than 1/2-inch in least dimension.

Support each ladder with welded or bolted aluminum brackets.

Provide minimum 72-inch high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

Mortar: Mortar shall consist of one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

FABRICATION

Workmanship and Finish:

Workmanship and finish shall be equal to the best general practice in modern shops.

Miscellaneous metal shall be clean and free from loose mill scale, flake rust and rust pitting, and shall be well formed and finished to shape and size with sharp lines and angles. Bends from shearing or punching shall be straightened.

The thickness of metal and details of assembly and support shall give ample strength and stiffness.

Built-up parts shall be true to line and without sharp bends, twists, and kinks. Exposed ends and edges of metal shall be milled or ground smooth, with corners slightly rounded.

Joints exposed to the weather shall be made up to exclude water.

Galvanizing: Items indicated on the plans to be galvanized shall be hot-dip galvanized after fabrication. The weight of galvanized coating shall be at least 1½ ounces per square foot of surface area, except drainage grates shall have at least 2 ounces per square foot of surface area.

Painting: Building miscellaneous metal items that are not galvanized shall be cleaned and coated with one prime coat prior to erection in accordance with the requirements specified under "Painting" in Section 12-9 of these special provisions. After erection, surfaces shall be coated with a second prime coat, and finish coats when specified, in accordance with the requirements specified under "Painting" in Section 12-9.

Loose Bearing and Leveling Plates: Loose bearing and leveling plates shall be furnished for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Plates shall be drilled to receive anchor bolts. Galvanize after fabrication.

Drainage Pipes, Frames and Grates:

Drain piping shall have connections sealed watertight.

Drainage grates shall have end bars of the same cross section as support bars. Connections between end bars and support bars of structural steel shall be welded all around.

Drainage frames shall be angles and plates as shown on the plans.

Drainage grates and frames shall be match marked.

Steel Pipe Railings and Handrailings:

Pipe handrailing shall consist of handrailing elements supported by metal brackets (wall type) or handrailing elements supported by tubular steel posts (post type).

Ends of railing pipe shall be closed, except for a 1/8-inch diameter weep hole at the low point.

All corners on railings shall be rounded. Simple and compound curves shall be formed by bending pipe in jigs to produce uniform curvature; maintain cylindrical cross-section of pipe throughout the bend without buckling, twisting or otherwise deforming exposed surfaces of the pipe.

Wall brackets, end closures, flanges, miscellaneous fitting and anchors shall be provided for interconnections of pipe and attachment of railings and handrails to other work. Inserts and other anchorage devices shall be furnished for connecting railings and handrails to concrete or masonry.

Steel railing shall be galvanized after fabrication. After galvanizing, all elements of the railing shall be free of fins, abrasions, rough or sharp edges, and other surface defects and shall not be kinked, twisted, or bent.

PART 3 - EXECUTION

GENERAL

Anchorages:

Anchorage devices and fasteners shall be provided for securing miscellaneous metal in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

Cutting, drilling, and fitting shall be performed as required for installation of miscellaneous metal fabrications. Work is to set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

Loose Leveling and Bearing Plates: Plates shall be set on wedges or other adjustable devices. Anchor bolts shall be wrench tightened after the plates have been positioned and plumbed. Mortar shall be packed solidly between bearing surfaces and plates to ensure that no voids remain.

Steel Pipe Railings and Handrailings:

Railings shall be adjusted prior to anchoring to ensure matching alignment at abutting joints. Secure posts and railing ends to building construction as shown on the plans.

Resin capsule anchors shall not to be used for anchoring railings and handrailings.

Powder Driven Anchors: Powder driven anchors shall be installed with low velocity powder actuated equipment in accordance with the manufacturer's instructions and State and Federal OSHA regulations.

Resin Capsule Anchors: Resin capsule anchors shall be installed in accordance with the manufacturer's instructions.

DAMAGED SURFACES

Galvanized surfaces that are abraded or damaged shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating. The clean areas shall then be painted with 2 spot applications of a coating conforming to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) and listed on MPI List Number 18, Primer, Zinc Rich, Organic.

12-5.05 STAIR NOSING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing stair nosings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data: Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

MANUFACTURERS

Acceptable Manufacturers: Subject to these special provisions, acceptable manufacturer's shall be American Safety Tread Co., Inc., Model No. FA-211D, Safety yellow color; Armstrong Products Inc., Model No. S62, Red color; Wooster Products Inc., Model No. WPC, Safety yellow color; or equal.

MATERIALS

Stair Nosing:

Stair nosing shall be factory fabricated units made of heavy duty, heat treated 6063-T5 extruded aluminum base with anchors and an abrasive filler.

Stair nosing shall meet OSHA requirements for anti-slip safety on stairs.

The anti-slip filler shall be firmly adhered to the base, and shall be composed of aluminum oxide and an epoxy binder. The color shall extend uniformly throughout out the filler. The filler shall contain not less than 60 percent aluminum oxide.

The base anchor system shall stabilize the nosing, prevent rocking and loosening, and shall permanently lock the nosing into place.

PART 3 - EXECUTION

INSTALLATION

The stair nosing shall be securely installed to prevent rocking or other movement during placing of concrete.

12-5.06 EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing vertical and horizontal expansion joint assemblies, fillers and sealers for expansion and seismic joints in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data: Manufacturer's descriptive data and installation instructions for vertical and horizontal expansion joint assemblies, seals and sealants shall be submitted for approval.

PART 2 - PRODUCTS

MANUFACTURERS

Acceptable Manufacturers: Subject to these special conditions, acceptable manufacturers shall be D. S. Brown Co.; General Tire Engineered Construction Products; Watson Bowman and Acme Corp. (Wabco); or equal.

MATERIALS

Expansion joint closures and seals shall be aluminum extrusions and neoprene or silicone rubber seals of the type and size to suit the construction as shown on the plans.

Aluminum Retainers and Cover Plates: Aluminum retainers and cover plates shall conform to ASTM Designation: B 221M, 6063-T5, anodized, of the configuration and size indicated or recommended by the expansion control system manufacture.

Visual Seals: Visual seal shall be dense neoprene or dense silicone synthetic rubber conforming to ASTM Designation: C 864, 70 durometer hardness, plus or minus 5.

Functional Seal: Functional seal shall be closed cell neoprene synthetic rubber conforming to ASTM Designation: C 509, medium density.

Fasteners: Fasteners shall be the expansion joint assembly manufacturer's standard corrosion resistant fasteners.

Sealant: Sealant shall be as recommended by the expansion joint assembly manufacturer.

PART 3 - EXECUTION

PREPARATION

Surface Preparation: Supporting joint surfaces shall be prepared as recommended by the manufacturer. Edges of the substrate shall be level and sound.

INSTALLATION

Expansion joint cover assemblies shall be installed and set to the proper width for the ambient temperature at the time of setting.

Nominal width shall be based on an ambient width shown on the plans.

Expansion joint cover assemblies shall be set according to the manufacturer's recommendations.

CLEANING

Unused materials, containers, and equipment shall be removed from the work area.

Surfaces that are stained, marred or otherwise damaged shall be cleaned and repaired.

SECTION 12-6. WOOD AND PLASTICS

12-6.01 FINISH CARPENTRY

PART 1 - GENERAL

SUMMARY

Scope: This work consists of furnishing and installing materials and performing finish carpentry, including exterior and interior trim, plywood soffits and panels and plywood and softwood paneling, as shown on the plans and these special provisions.

Finish carpentry includes carpentry work not specified as part of other sections and which is generally exposed to view.

SUBMITTALS

Product Data: Manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

Samples: One sample shall be submitted to the Engineer at the jobsite for each species and cut or pattern of finish carpentry as shown below:

Exterior standing and running trim: 2 feet long x full board or molding width, finished on one side and one edge.

Interior standing and running trim: 2 feet long by full board or molding width, finished on one side and one edge.

Siding: 2 feet long, finished on one side and one edge.

Exterior plywood for transparent finish: 2 feet long x panel width, finish shall be applied to upper half of each piece.

Plywood paneling: 2 feet long x full panel width, finished on one side.

QUALITY ASSURANCE

Factory Marks: Each piece of lumber and plywood shall be marked with type, grade, mill and grading agency identification. Marks shall be omitted from surfaces to receive transparent finish. A mill certificate stating that material has been inspected and graded in accordance with requirements shall be furnished if marks cannot be placed on concealed surfaces.

PRODUCT DELIVERY, STORAGE AND HANDLING

Delivery: Carpentry materials shall be delivered after painting, wet work and similar operations have been completed.

Protection: Finish carpentry materials shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2 - PRODUCTS

WOOD PRODUCT QUALITY STANDARDS

Plywood: Plywood shall conform to the requirements of Voluntary Products Standard PS-1, "U. S. Product Standard for Construction and Industrial Plywood."

MATERIALS

Open Shelving: Open shelving shall be ¾-inch Grade A-C fir plywood with veneer core and 1/2-inch thick solid stock pine edge banding glued and nailed.

Miscellaneous Materials:

Nails, screws and other anchoring devices of the type, size, material and finish required shall be provided for secure attachment, concealed where possible.

Fasteners and anchorages for exterior use shall be hot dip galvanized.

Screens for soffit vents shall be 4 x 4 or 8 x 8 mesh, galvanized screen. Open area shall be not less than 50 percent.

Preservative Treatment:

Preservative treatment shall be copper napthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

Wood members, except those of redwood, in contact with mortar setting beds, concrete block walls, slab on grade and other concrete work, and wood used for roofing cant and curbs shall be pressure treated with leach resistant preservative. Each piece of pressure treated lumber shall bear the AWPA label.

All holes, daps, or cuts made after treating shall be thoroughly swabbed with copper napthenate

Fire Retardant Treatment: Fire retardant treatment shall be paintable, odorless fire retardant preservative applied by pressure treating methods.

PART 3 - EXECUTION

INSTALLATION

All work shall be installed plumb, level and true with no distortions.

Standing and Running Trim:

Standing and running trim shall be installed with minimum number of joints possible, using full length pieces to the greatest extent possible.

Exterior joints shall be made water-resistant by careful fitting.

Anchor Finish Carpentry:

Finish carpentry shall be anchored to framing or blocking built in or attached directly to the substrate.

Interior carpentry shall be attached to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing where required for complete installation. Fine finish nails shall be used for exposed nailing, countersunk and filled flush with finished surface and matching final finish where transparent finish is indicated.

Finish exterior siding shall be fastened with corrosion resistant nails. The size and spacing of the siding fasteners shall be as shown on the plans. Nails shall be driven flush with the surrounding surfaces, not countersunk. Nails shall be located in the grooves of grooved siding whenever possible.

ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

Damaged and defective finish carpentry work shall be repaired or replaced.

All exposed or semi-exposed surfaces shall be cleaned.

Finish carpentry shall be finished in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-6.02 CABINETS

PART 1.- GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing wood cabinets and plastic laminate tops, splashes and returns including tops, ledges, supporting structures, filler panels, knee space panels, and scribes as shown on the plans and in these special provisions.

SUBMITTALS

Product data: Manufacturer's product data for plastic laminates and cabinet hardware shall be submitted for approval.

Samples: Five samples shall be submitted for each of the items shown below:

Plastic laminate: 12 in x 12 in for each type, color, pattern surface finish, and edging.

Stainless steel:

a. Solid surface: 12 in x 12 in for each color, pattern, and edging.
b. Molded epoxy resin: 10 in x 12 in for each type, color, pattern and surface finish.
c. Countertop support bracket.
d. Edge molding: standard manufacturer’s color and sample palette.

Working drawings: Working drawings for cabinets showing location of cabinets, dimensioned plans and elevations, attachment devices and other components shall be submitted for approval. Working drawings shall

bear the "WIC Certified Compliance Label" on the first sheet of the drawings. Provide roughing in drawings for mechanical and electrical services where required.

CERTIFICATE OF COMPLIANCE

Certificates of Compliance: Prior to delivery to the jobsite, the cabinet manufacturer shall issue a WIC Certified Compliance Certificate indicating that the products he will furnish for this job and certifying that they will fully meet all the requirements of the grade or grades specified.

Codes and standards: Cabinets and swinging gate shall be manufactured and installed in accordance with the Manual of Millwork of the Woodwork Institute of California (WIC) requirements for the grade or grades specified or shown on the plans.

WIC Certified Compliance Label shall be stamped on all cabinet work. Each plastic laminate top shall bear the WIC Certified Compliance Label. Prior to completion of the contract, a WIC Certified Compliance Certificate for Installation shall be delivered to the Engineer.

Samples: Furnish a full size base and wall cabinet showing actual construction and materials to be used including counter tops.

Deliver samples to the site.

Acceptable samples may be incorporated into the Work.

DELIVERY, STORAGE AND HANDLING

Protection: Cabinets shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2.-PRODUCTS

ACCEPTABLE MANUFACTURERS

Manufacturers: Subject to compliance with these specifications, high pressure decorative laminates shall be Consoweld Corp.; Formica Corp.; Nevamar Corp.; or equal.

MANUFACTURED UNITS

General: Cabinets shall be fabricated to the dimensions, profiles, and details shown on the plans with openings and mortises precut, where possible to receive hardware and other items and work. Fabrication, assembly, finishing, hardware application, and other work shall be completed to the maximum extent possible prior to shipment to the jobsite.

Laminate clad cabinets: Laminate clad cabinets shall be custom grade, flush overlay construction. Laminate cladding shall be high pressure decorative laminate complying with NEMA LD 3. Color, pattern and finish shall be as shown on the plans. Laminate surface and grade shall be as follows:

Horizontal and vertical surfaces other than tops shall conform to GP-50 (1.27 mm nominal thickness).

Post formed surfaces shall conform to PF-42 (1.07 mm nominal thickness).

Laminated counter tops and splashes: Laminated counter tops and splashes shall be WIC custom grade. Surface material shall be high pressure laminated plastic conforming to NEMA LD-3, 1.27 mm thickness. Unless otherwise shown on the plans, splashes shall be 4 in high from the surface of the deck. Back splashes shall be continuous formed and coved. Side splashes shall be top set. The underside of tops and backsides of splashes shall be covered with an approved backing sheet.

Moulded epoxy resin tops: Epoxy resin tops shall be heavy duty laboratory type epoxy compounded and cured to provide optimum physical and chemical resistance properties. Epoxy resin tops and curbs shall be uniform mixture through full thickness. Tops and curbs shall be non-glaring and bonded to form a water tight joint.

Solid-surfacing-material countertops: Custom grade, 3/4-inch thickness, fabricate tops in one piece unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing

CABINET HARDWARE AND ACCESSORY MATERIALS

General: Cabinet hardware and accessory materials shall be provided for cabinets. Hardware shall be provided with standard US 32D metal plated finish, unless noted otherwise on plans.

Drawer slides: Drawer slides shall be side mounting full extension with fully enclosed rolling balls and rollers. Concealed slides and bearings, and positive stop. Capacity shall be not less than 75 lb, except capacity shall be not less than 100 lb for heavy duty drawers.

Door guides: Sliding door guides shall be continuous, dual channel, metal guides, top and bottom. Bottom guide shall have crowned track.

Shelf supports: Shelf supports shall be adjustable, semi-recessed, chrome finished pressed metal, heavy duty standards and support clip, with one inch adjustment increments.

Cabinet hinges: Cabinet hinges shall be steel concealed European style with vertical and horizontal adjustment, one hinge per door shall be self closing.

Cabinet pulls: Cabinet pulls shall be 3/8 inch diameter approximately 5 inch long approximately 1 3/8 inch offset, stainless steel satin finish.

Flush metal pull: Flush metal pull shall be 2 3/4 inch diameter, 3/8 inch deep, with zinc chrome-plated matt finish.

Cabinet deadlocks: Cabinet deadlocks shall be offset bolt with 1/2 inch throw, made of zinc die cast cylinder housing, with black nylon lock case.and nickel-polished finish.

Panel fasteners: Panel fasteners shall be made of macrolon and have releases which do not require tools. Cabinet suspension fittings shall be manufactured by Hafele, Model Keku Suspension Fittings P.A.S. or approved equal. Panel fasteners shall be used on removable access panels including all ADA panels at countertop sinks. as indicated on plans.

Cable Grommets: Cable grommets shall be two piece sets, 2-3/8 in diameter round, with spring closure. Provide grommets for all cables. Cable grommets shall be black plastic manufactured by Hafele, Model 429.99.324 or approved equal.

Backsplash railing system:

Backsplash railing system shall be made of stainless steel with chrome-plated polished finish.

Tubular shall be approximately 5/8" diameter. with decorative end cap and plastic sleeve.

Rail post shall be approximately 5/8" diameter, press fits over concealed fastening screws.

Shelf shall be approximately 18"x10" single shelf, with open wire grate and plastic caps ends to prevent marring of wall and railing.

Edge molding: Elastomer urethane continuous seamless molding, 75 Shore A Durometer, cross section configuration as shown on plans, semi-soft to accommodate radiused or mitered corner conditions, stain resistant, UV stable, self extinguishing flame retardant, tongue and grove installation with epoxy adhesive, Edge mould products, T-Edge bull nose.

Countertop support bracket: Prefinished steel welded construction, predrilled mounting holes for both table top and wall mounting, 1100 pound load capacity per pair.

Lavatory protective enclosure: ADA compliant under sink lavatory protective enclosure, protection for wheelchair accessibility, single piece, rigid high impact resistant PVC, nominal wall 0.093", UL listed.

Monitor Suspension System:

Minimum work surface depth 24-inch, suspension frame for monitor with 1/4" tinted and tempered glass viewing surface and glare shield and trim grommet.

Keyboard width shall be 28-inch, with load capacity 44 lbs.Ball bearing slide for keyboard support. Chromated steel. Variable installation height 2 1/2" to 3 3/4" via 4 slot positions of height-adjustable mounting bracket. Precision slide with holding feature and roll-out prevention.

Finish shall be steel, epoxy powder-coat.

FABRICATION

Shop assembly: Nails shall be countersunk and the holes filled, molds shall be neatly mitered and all joints shall be tight and true. As far as practicable, work shall be assembled at the mill and delivered to the building ready to be set in place. Parts shall be smoothly dressed and interior work shall be belt sanded at the mill and hand sanded at the building. After assembly, work shall be cleaned and made ready for the specified finish. All work shall be prepared to receive finish hardware. Finish hardware shall be accurately fitted and securely fastened as recommended by the manufacturer. Finish hardware shall not be fastened with adhesives. Drawers shall be fitted with dust covers of 6 mm plywood or hardboard above compartments and drawers except where located directly under tops.

Precut openings: Openings for hardware, appliances, plumbing fixtures, and similar items shall be precut where possible. Openings shall be accurately located and templates used for proper size and shape. Edges of cutouts shall be smoothed and edges sealed with a water-resistant coating.

PART 3.- EXECUTION

INSTALLATION

Cabinets: Cabinets shall be installed without distortion so that doors and drawers fit openings properly and are accurately aligned. Hardware shall be adjusted to center doors and drawers in openings and to provide unencumbered operation. Installation of hardware and accessory items shall be completed as indicated on the approved drawings.

Laminate tops: Laminate tops shall be securely fastened to base units and other support systems as indicated on the approved drawings.

Cabinet hardware: Doors for cabinets shall be equipped with one pair of hinges and one catch per leaf, unless otherwise shown on the plans. Each door leaf shall be equipped with one pull.

Drawers up to 12 in wide shall have one pull and drawers over 12 in wide shall have two pulls.

Blocking shall be provided in the wall between wall framing as necessary to anchor cabinet supports.

SECTION 12-7. THERMAL AND MOISTURE PROTECTION

12-7.01 WATERPROOFING

PART 1.- GENERAL

SUMMARY

Scope.--This work shall consist of furnishing and installing a premolded bituminous sheet waterproofing system, geocomposite drain, filter fabric, slotted pipe, and free draining granular material in accordance with the details shown on the plans and these special provisions.

The premolded membrane waterproofing system shall consist of an adhesive or primer coating, a premolded bituminous sheet, mastic for sealing the edges of the sheet, and a protective covering attached to the exposed bituminous sheet.

SUBMITTALS

Product data.--Manufacturer's descriptive data, installation instructions and recommendations for each waterproofing material, geocomposite drain, and filter fabric, shall be submitted for approval.

QUALITY ASSURANCE

Single source responsibility.--Primary waterproofing materials shall be obtained from a single manufacturer and secondary materials shall be only as recommended by the manufacturer of the primary materials.

Labels.--Materials shall be furnished which have factory-applied labels affixed to each container or roll of material certifying compliance with ASTM standards specified.

Certificates of Compliance.--Certificates of Compliance shall be furnished for the filter fabric and geocomposite drain in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2.- PRODUCTS

Premolded membrane:

Preformed membrane shall be premolded sheets of bitumen and other compounds, laminated between bituminous saturated felts, reinforced with glass fiber of similar fabrics or mats, coated with bitumen and covered with plastic anti-stick film. Vapor transmission rating shall be not more than 0.005 grains per square meter per hour when tested in accordance with ASTM Designation: E 96 and weight approximately 29 kg per 10 meters square.

Adhesives:

Adhesives shall be types of adhesive compounds and tapes recommended by the waterproofing manufacturer, for bonding to substrate, for waterproof sealing of seams in membrane and for waterproof joints between membrane and flashings, adjoining surfaces and projections through membrane.

Primer:

Primer shall be type of concrete primer recommended by the manufacturer of the sheet waterproofing.

Protective covering:

Protective covering shall be hardboard, 3 mm thick or such other material that will furnish equivalent protection to the preformed membrane. Protective covering shall prevent cutting, scratching, depression or any other damage to the membrane caused by concrete, backfill material or equipment.

Geocomposite drain:

Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick not more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain shall produce a flow rate, through the drainage void, of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa.

The manufactured core shall be either a preformed grid of embossed plastic, a mat of random shapes of plastic fibers, a drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels, or a system of plastic pillars and interconnections forming a semirigid mat.

Filter fabric shall conform to the requirements specified for underdrains in Section 88-1.03, "Filter Fabric," of the Standard Specifications and these special provisions.

Slotted pipe:

Slotted pipe shall be plastic pipe and shall conform to the requirements specified for pipe for edge drains in Section 68-3.02A, "Pipe and Pipe Fittings," of the Standard Specifications and these special provisions.

Free draining granular material:

Free draining granular material shall conform to the requirements specified for "Free Draining Granular Material" in Section 12-2, "Sitework," of these special provisions.

PART 3.- EXECUTION

General:

- Preformed membrane waterproofing shall not be applied to any surface until the Contractor is prepared to follow its application with the placing of the protective covering and concrete or backfill within a sufficiently short time that the membrane will not be damaged by workers, equipment, exposure to weathering or from any other cause.

  Damaged membrane or protective covering shall be repaired or replaced by the Contractor at his expense.

PREPARATION

Surface preparation: All surfaces which are to receive waterproofing shall be reasonably smooth and free from holes and projections which might puncture the membrane. The surface shall be dry and thoroughly cleaned of dust and loose materials.

Prime coat:

The primer shall be applied in one coat to the entire area to be sealed by spray or roller methods. The rate shall be as recommended by the primer manufacturer.

All primers shall be thoroughly mixed and continuously agitated during application. Primers and adhesive shall be allowed to dry to a tack free condition prior to placing membrane sheets.

INSTALLATION

Application:

Preformed membrane material shall be placed vertically with each successive sheet lapped to the preceding by a minimum of 3 inches. Horizontal splices shall be lapped by a minimum of 6 inches.

Exposed edges of membrane sheets shall have a trowelled bead of manufacturer's recommended mastic applied after the membrane is placed.

Holes or tears in the preformed membrane sheeting shall be patched with an additional layer of membrane sheet of sufficient size to provide a 127 mm minimum lap outside the edge of the defect.

Protective covering:

The surface of the waterproofing membrane shall be cleaned free of all dirt and other deleterious material before the protective covering is placed.

The protective covering shall be placed on a coating of adhesive of a type recommended by the manufacturer. The adhesive shall be applied at a rate sufficient to hold the protective covering in position until the concrete or backfill is placed.

Geocomposite drain:

The filter fabric shall be aligned and placed in a wrinkle-free manner.

The core material and filter fabric shall be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric shall be integrally bonded to the side of the core material with the drainage void. Core material manufactured from impermeable plastic sheeting having nonconnecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.

The geocomposite drain shall be installed with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side shall overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wrap-around at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.

Should the fabric on the geocomposite drain be torn or punctured, the damaged section shall be replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a minimum 150 mm overlap.

12-7.02 WATER REPELLENT COATING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and applying water repellent coating to concrete or masonry surfaces in accordance with the details shown on the plans and these special provisions.

The water repellent coating shall be applied to all exterior concrete or masonry surfaces and exposed aggregate surfaces as shown on the plans.

SUBMITTALS

Product Data: Manufacturer’s descriptive data, application instructions and general recommendations for water repellents shall be submitted for approval.

QUALITY ASSURANCE

Codes and Standards: Water repellent coatings shall comply with all rules and regulations concerning air pollution in the State of California.

Certificates of Compliance: Certificates of Compliance shall be furnished with each shipment of water repellent coating materials in accordance with Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2 - PRODUCTS

Water Repellent Coating: Water repellent coating shall be clear, colorless, water-based sealer. Water repellent coating shall be Hydrozo Inc., Clear Double 7; Euclid Chemical Co., Architectural Seal VOX; Tamms Industries Co., Chemstop; or equal.

PART 3 - EXECUTION

Preparation: All surfaces to receive water repellent coating shall be dry and cleaned by removing contaminants that block pores of the surface. Cleaning methods shall be as recommended by the water repellent manufacturer.

Application:

The water repellent solution shall be applied in accordance with the manufacturer's printed instructions

The time period between applications of water repellent coating shall be not less than 24 hours.

Protection: Surfaces of other materials surrounding or near the surfaces to receive the water repellent coating shall be protected from overspray or spillage from the waterproofing operation. Water repellent coating applied to surfaces not intended to be waterproofed shall be removed and the surfaces restored to their original condition.

12-7.03 INSULATION (GENERAL)

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing insulation in accordance with the details shown on the plans and these special provisions.

Insulation materials shall be as specified in these special provisions, and shall be compatible with existing or new materials incorporated in the building.

SUBMITTALS

Product Data:

A list of materials, manufacturer's descriptive data, location schedule, and time schedule shall be submitted for approval.

The list of materials to be used shall include the trade name, manufacturer's name, smoke developed and flame spread classification, resistance rating and thickness for the insulation materials and accessories.

Schedules:

A location schedule and time schedule shall be submitted for approval.

The location schedule shall show where each material is to be installed.

The Contractor shall provide the Engineer at the jobsite with an accurate time schedule of the areas of the building to be insulated each day. The time schedule shall be submitted 3 working days in advance of the work.

Samples: Samples of insulation material shall be submitted to the Engineer at the jobsite.

QUALITY ASSURANCE

Codes and Standards: All insulating materials shall be certified to comply with the California Quality Standards for Insulating Materials and shall be listed in the Department of Consumer Affairs publication "Consumer Guide and Directory of Certified Insulation Material."

DELIVERY, STORAGE AND HANDLING

Insulating materials shall be delivered to the jobsite and stored in a safe dry location with labels intact and legible.

Insulating materials shall be protected from physical damage and from becoming wet or soiled.

In the event of damage, materials shall be repaired or replaced as necessary to comply with these specifications.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

12-7.04 BATT AND BLANKET INSULATION

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing batt or blanket insulation in accordance with the details shown on the plans and these special provisions.

Batt insulation shall include faced and unfaced batts in walls and ceilings, acoustical batts for sound control and exposed batt or blanket insulation for ceilings and walls.

QUALITY ASSURANCE

Laminator's Qualifications:

Laminator for bonding polyethylene vapor-retarder to insulating batts shall be approved by the insulation manufacturer.

The name of the laminator shall be submitted with the Product Data.

Codes and Standards:

All batt or blanket insulation, including facings such as vapor barriers, shall have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with ASTM E-84.

The flame-spread and smoke density limitations do not apply to facings on batt insulation installed between ceiling joists, or in roof-ceiling or wall cavities, provided the facing is installed in substantial contact with the surface of the ceiling or wall finish.

PART 2 - PRODUCTS

INSULATING MATERIALS

Fiberglass batts shall be thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM Designation: C 665.

Wall Insulation: Wall insulation shall be R-19 fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Ceiling Insulation: Ceiling insulation shall be R-38 fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Acoustical Insulation: Acoustical insulation shall be 3½ inches, unfaced fiberglass insulation batts. Insulation shall conform to ASTM Designation: C 665, Type I.

VAPOR-RETARDERS

Polyethylene Vapor-retarder: Polyethylene vapor-retarder shall be factory-applied, 3 mils, white polyethylene film, a blend of fiberglass and polyester yarn reinforcement, and metallized polyester film laminated with a flame resistant adhesive, and a Class I flame-spread classification.

AUXILIARY INSULATION MATERIALS

Insulation Tape: Insulation tape shall be as recommended by the insulation manufacturer.

Insulation Adhesive: Insulation adhesive shall be the type recommended by the insulation manufacturer and complying with the requirements for fire resistance.

Impaling Pins: Impaling pins shall be self-adhering wire pins with sheet metal retaining clips and protective rubber tips. Adhesive for pins shall be as recommended by the pin manufacturer.

Line Wire: Line wire shall be commercial quality 20-gage galvanized steel wire.

FABRICATION

Polyethylene shall be factory laminated to fiberglass batts or blankets by an applicator approved by the manufacturer of the batts or blankets.

PART 3 - EXECUTION

INSTALLATION

The vapor retarder on faced batts shall be toward the interior and shall be fastened to provide a sealed retarder. Punctures and holes in the retarder shall be repaired.

Unless otherwise shown on the plans or specified elsewhere in these special provisions, insulation shall be kept at minimum 3 inches clear of lighting fixtures and heat producing electrical appliances and equipment.

Installing Batt Type Insulation: Insulation batts shall be installed to completely fill the space between framing members. Apply a single layer of insulation of required thickness, unless otherwise shown on the plans or required to make up total thickness. Installation shall conform to the manufacturer's recommendations and these special provisions.

Installing Exposed Insulation:

Exposed insulation shall be installed on impaling pins adhered to the substrate at 16-inch centers each direction with a minimum distance of 4 inches to the edge of the batt. Retainer clips shall be placed onto the pins so that the batt is slightly compressed. Pins shall be cut within ½ inch of the retaining clips and protective rubber caps placed on the ends of the pins.

When line wire is shown on the plans, blankets shall be supported with line wire spaced at 16 inches on center.

Joints in exposed insulation shall be sealed by lapping not less than 4 inches. Exposed insulation shall be fastened to framing at top, end and bottom, at perimeter of wall openings and at lap joints.

Overlapping joints shall be sealed with insulation adhesives as recommended by vapor retarder manufacturer's printed directions. Butt joints and fastener penetrations shall be sealed with insulation tape of the type recommended by the vapor retarder manufacturer. Joints at pipes, conduits, electrical boxes and similar items penetrating the vapor retarder shall be sealed.

12-7.05 RIGID WALL INSULATION

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing rigid wall insulation in accordance with the details shown on the plans and these special provisions.

Rigid insulation shall include rigid insulation, fasteners and such other materials, not mentioned, which are required for the complete installation of the rigid insulation system.

QUALITY ASSURANCE

Codes and standards: Rigid foam insulation shall have a flame-spread rating not to exceed 75 and a smoke density not to exceed 450 when tested in accordance with ASTM E-84. Rigid foam insulation shall be approved in accordance with CBC Section 2603.4 to be installed exposed, or without a thermal barrier on the room side of the insulation.

PART 2 - PRODUCTS

Rigid insulation: Rigid insulation shall be rigid closed cell extruded rectangular boards of polystyrene foam with aluminum foil facing on both sides and an aged thermal resistance of R-5. Facing on exposed insulation shall be white tinted aluminum foil.

Metal Furring: Shall be "Z" shape galvanized metal.

Insulation tape: Insulation tape shall be as recommended by the insulation manufacturer.

Adhesive: Adhesive shall be construction grade panel adhesive as recommended by the insulation manufacturer.

PVC strips: PVC strips shall be interlocking male and female white PVC strips.

Fasteners: Fasteners shall be concrete nails; Bostich, Pneumatic Nail System; Buildex, Tampcon Fasteners; or equal.

PART 3 - EXECUTION

Installation of rigid insulation:

The preparation of the wall surfaces and the installation of insulation shall conform to the manufacturer's recommendations and these special provisions.

Rigid insulation placed behind plywood or gypsum board shall be tight fitting between "Z" galvanized metal furring and spaced 2 feet on center.

Exposed rigid insulation shall be installed tight fitting between PVC strips spaced at 4 feet on center. PVC strips shall align with the vertical joints of the plywood below. Adhesive shall be applied to the PVC strips and the wall as recommended by the insulation manufacturer.

All joints between insulation boards shall be taped.

Insulation panels with broken or crushed corners or edges shall be trimmed free of such defects or shall be discarded. Replacement boards less than 12 inches wide shall not be used.

Damaged insulation in the completed work shall be removed and replaced. Insulation that has been wet or is wet shall be considered damaged.

12-7.06 ROOF BOARD

PART 1.- GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing roof board in accordance with the details shown on the plans and these special provisions.

Roof board shall include, fasteners and such other materials, not mentioned, which are required for the complete installation of the roof board system. Materials and installation shall be coordinated with the roof covering system to meet the requirements for a Class 1 Factory Mutual approved assembly.

SYSTEM DESCRIPTION

Design Requirements: The roof board installation shall conform to the wind design requirements for uplift in Chapter 16 of the California Building Code for the wind speed and exposure shown on the plans.

SUBMITTALS

Product Data:

Manufacturer's technical product data, installation instructions, and recommendations for each type of roof board material shall be submitted for approval.

Product data shall include the manufacturer's name and a complete material description of all components of the roof board installation.

Samples

Material samples shall include a 1 ft x 1 ft sample of the roof for each color to be installed and a sample of each anchor clip and fastening device.

Working Drawings:

Working drawings showing the layout and details of the roof board installation shall be submitted for approval.

Working drawings shall show the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; and details of connections.

Design calculations for the fastening system with the metal roof decking shown on the plans shall be submitted to verify compliance with the design requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer's signature shall be original.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of Compliance shall be furnished for the roof board system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, HANDLING AND STORAGE

Delivery and handling.--Panels shall be protected against damage and discoloration.

Storage.--Panels shall be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

PART 2.- PRODUCTS

Roof board:

Roof board shall be panels 4-foot by 8 foot or greater 12 foot-long, 1/2 inch to 5/8 inch in thickness. Long edges of panels shall be interlocking and panels shall have guide markings clearly printed on the top surface of each board to facilitate the proper location and spacing of the screw fasteners. Roof board shall be USG, Securock Georgia Pacific, DensDeck; or equal.

Composition: Impact-resistant nonstructural fiber-reinforced gypsum panels made from 95% recycled materials. Moisture and mold resistant throughout the panel core and surface.

Fire Resistance:

Flame spred 5/smoke developed 0, when tested in accordance with ASTM E 84.

Class A when tested to UL 790,. Refer to UL Directory for Classified systems.

Surface water absorption, nominal grams per ASTM C473.

Water resistance: Weight percentage gain maximum 10% when tested in accordance with ASTM C472.

Mold resistance: Maximum rating of "10" in accordance with ASTM D 3273.

Flexural strength: Parallel .ASTM C 473.

Flute span: ASTM E 661.

Compressive strength: ASTM C 472

Fastener (metal decking)

Fastener (metal decking) shall be galvanized spring steel barbed clip driven through galvanized 1 inch minimum nominal diameter caps; galvanized hardened steel nail with 1 inch minimum nominal diameter head and serrated shank to provide backout resistance; or threaded self tapping screw driven through minimum nominal diameter galvanized cap.

EXECUTION

Preparation:

The preparation of the insulation surfaces shall conform to the manufacturer's recommendations and these special provisions.

The insulation surface shall be made smooth and level.

Installation:

The roof board shall be mechanically fastened as shown on the approved working drawings. Panels that are cracked or broken by the installation of the mechanical fasteners shall be replaced.

The completed layer of roof board shall be smooth and level, and suitable for the proper bedding of succeeding layers of roofing material.

Continuous joints between roof board units and parallel to insulation units below shall be offset 6 inches.

Roof boards with broken or crushed corners or edges shall be trimmed free of such defects or shall be discarded. Replacement boards less than 12 inches wide shall not be used.

Damaged roof board in the completed work shall be removed and replaced. Roof board that has been wet or is wet shall be considered damaged.

12-7.07 RIGID ROOF INSULATION

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing rigid roof insulation in accordance with the details shown on the plans and these special provisions.

Rigid insulation shall include rigid insulation, underlayment, wood nailers, fasteners and such other materials, not mentioned, which are required for the complete installation of the rigid insulation system. Materials and installation shall be coordinated with the roof covering system to meet the requirements for a Class 1 Factory Mutual approved assembly.

PART 2 - PRODUCTS

Underlayment: Underlayment shall be building paper, Type I (No. 15) asphalt roofing felt, or rosin-sized paper.

Rigid Roof Insulation: Rigid roof insulation shall be multilayer, preformed board roof insulation having thermal conductance or resistance as shown on the plans. Glass fiber board conforming to ASTM Designation: C 726, or expanded perlite board conforming to ASTM Designation: C 728, or wood fiber board conforming to ASTM Designation: C 208.

Insulation Tape: Insulation tape shall be as recommended by the insulation manufacturer.

Fastener (Metal Decking): Fastener (metal decking) shall be galvanized spring steel barbed clip driven through galvanized one-inch minimum nominal diameter caps; galvanized hardened steel nail with one-inch minimum nominal diameter head and serrated shank to provide backout resistance; or threaded self tapping screw driven through 3-inch minimum nominal diameter galvanized cap.

PART 3 - EXECUTION

Preparation:

The preparation of the deck surfaces shall conform to the manufacturer's recommendations and these special provisions.

The deck surface shall be made smooth and level.

Installation:

Insulation panels shall be placed in at least 2 layers with end joints staggered and with joints of the second layer offset at least 6 inches from joints in the first layer.

Insulation panels shall be oriented with the long side perpendicular to the direction roofing felts are to be laid. End joints between panels shall be staggered.

Insulation clips and fasteners shall resist the wind uplift classification specified for the roof covering.

The first layer of insulation shall be mechanically fastened as recommended by the manufacturer to meet the requirements of the Factory Mutual Loss Prevention Data 1-28. At least one fastener per 2 square feet of insulation panel shall be used. Panels that are cracked or broken by the installation of the mechanical fasteners shall be replaced.

Additional layers of insulation shall be secured with a solid uniform application of hot bitumen applied at the rate of 30 pounds per 100 square feet.

The completed layer of insulation shall be smooth and level, and suitable for the proper bedding of succeeding layers of roofing material.

Insulation shall be laid just before application of roofing felts. Units shall be laid in parallel courses with transverse joints staggered, in moderate contact with adjoining surfaces.

No more insulation shall be laid than can be covered with roofing the same day. Cutoffs of 2 layers of hot mopped Type I (No. 15) asphalt saturated felt shall be installed, not less than 4 inches onto completed work and extended out not less than 6 inches onto the deck, at exposed edges of insulation at the end of each day's work. Cutoffs shall be removed when work is resumed.

Joints in the top layer of glass fiber roof insulation shall be taped with 6-inch wide felt stripping set in hot asphalt mopping.

Continuous joints between insulation units and parallel to decking flutes shall not occur over the flute openings. Both units shall have full edge bearing on rib tops.

Insulation panels with broken or crushed corners or edges shall be trimmed free of such defects or shall be discarded. Replacement boards less than 12 inches wide shall not be used.

Damaged insulation in the completed work shall be removed and replaced. Insulation that has been wet or is wet shall be considered damaged.

12-7.08 METAL ROOFING, LOW SLOPE

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing preformed, seal seam metal roofing, in accordance with the details shown on the plans and these special provisions.

Metal roofing system shall consist of underlayment, prefinished metal roofing, roof drains, downspouts, fasteners, sealants, and accessories and components, not mentioned, which are required for a complete, securely fastened and watertight installation.

SYSTEM DESCRIPTION

Design Requirements:

The roofing system shall conform to the wind design requirements for uplift or outward pressures in accordance with Chapter 16 of the CBC and ASCE 7-05 for the wind speed, uplift and exposure shown on the plans.

Factory formed, Pre-finished, sealed-seam metal roofing system with non-thermal bridging fastening system over rigid insulation substrate. Includes steel framing and support structure, roof panels, flashings, edges, and terminations pre-fabricated and furnished by the roof panel manufacturer.

Install 3/4" insulation between hat channel. Hat channels to be installed over layerd installation boards to achieve R-30 insulation value.

SUBMITTALS

Product Data:

Manufacturer's technical product data, installation instructions, and recommendations for each type of roofing material shall be submitted for approval.

Product data shall include the manufacturer's name and a complete material description of all components of the metal roofing system.

Samples:

Submit five samples of roofing panel system.

Material samples shall include a 12" x 12" sample of the roofing panels for color to be installed and a sample of anchor clip and fastening device with insulation.

Working Drawings:

Working drawings showing the layout and details of the roofing system shall be submitted for approval.

Working drawings shall include the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; details of connections and closures; and details for expansion joints and watertight joints.

Design calculations for the fastening system of the roof and wall panels with the substrate shown on the plans shall be submitted to verify compliance with the design requirements.

Working drawings and design calculations and wind uplift calculations (per ASCE 7-05) shall be stamped and signed by an engineer who is registered as a Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer’s signature shall be original.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of compliance shall be furnished for the metal roofing system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Warranty: Manufacturer to provide 30 year limited watertight warranty that includes all metal coping cap, flashings, trims, and penetrations. Installer to provide 4 year workmanship warranty to roof system manufacturer. Panel finish warranty shall be standard peeling and fade warranty as provided by coating manufacturer for a period of 20 years.

Manufacturer's Inspections: The roof system manufacturer will perform jobsite inspections minimum one day per week and provide inspection reports, with photographs, to the Engineer on the quality and progress of the workmanship being performed. Shall notify the Engineer in writing of any failure of the installer to correct items as required by the manufacturer.

DELIVERY, HANDLING AND STORAGE

Delivery and Handling: Metal panels shall be protected against damage and discoloration.

Storage: Metal panels shall be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

PART 2 - PRODUCTS

MATERIALS

Aluminum-Zinc Alloy Coated Steel: Steel sheet, Aliminum-Zinc Alloy-Coated, ASTM A792, Coating Designation AZ-50 or AZ-55, in thickness of .0157 for field panel, .0217 or .0336 for accessory components, .0336 for framing pieces by min. 36 inches to 48 inches by coil width, chemically treated, commercial or lock-forming quality. Product shall be labeled by the Cool Roof Rating Council to have an initial solar reflectance of 0.70 or greater, and initial thermal emittance of 0.75 or greater.

Expanded Polystyrene Roof Insulation: Expanded polystyrene (EPS) insulation board manufactured with Arco Dylite in 77B resin or BASF Resin beads or equal.

Density: 1.5 pcf.
Thickness: 3/4"
UL listed under Foamed Plastic (BRYX) or (CCVW)
Federal Specification HH-I-1972, Class 1
Dimensional Stability ASTM D-2126 2% max.
Compressive Strength ASTM D1621 10 psi min.
Water Absorption ASTM C-272 4.0
R-factor HR per inch
Thickness ASTM C-177 3.85 (Design Value)

Expanded Polystyrene Tapered Roof Insulation

Tapered Thickness: Minimum 1/2" at low points
Tapered Slope: 1/2" per foot
Tapered edge Strips: 1/2" per foot
Tapered Cricket: 1/2" per foot taper minimum

METAL FINISHES

Coatings shall be factory applied siliconized modified polyester finish epoxy primer baked both sides. .2-.25 mils thickness. Color to be white and meet Title 24 requirements for "Cool Roof" coating.

Finish shall be the manufacturer's standard Kynar coating with a baked on primer (0.2 mil) and a finish coat of 0.8-mil nominal for a total dry film thickness of approximately 1.0-mil nominal.

Interior finish shall consist of a 0.15-mil epoxy primer and a backer coat.

MISCELLANEOUS MATERIALS

Fasteners: As recommended and supplied by the metal roofing system manufacturer. Fasteners shall be FM 4470 pinch point, fluorocarbon coated.

Underlayment: Underlayment shall be fire rated membrane as recommended by the metal roofing system manufacturer to provide UL tested roof assembly.

Sealant and Sealant Tape: Sealant and sealant tape shall be as recommended by the metal roofing manufacturer.

Closures: Closures shall be rubber, neoprene, closed cell plastic or prefinished metal.

FABRICATION

Unless otherwise shown on the plans, or specified herein, roof panels shall be fabricated in continuous lengths for the length of the roof, from ridge or peak to eaves, except such length shall not exceed the manufacturer's maximum production length.

Flashings shall be fabricated in the longest practical lengths.

Roofing panels shall be factory formed, field formed panels are not acceptable.

PART 3 - EXECUTION

INSTALLATION

Underlayment: The roofing panels shall be installed over underlayment. Underlayment shall be laid parallel to the eaves, shingle fashion with 6-inch edge laps and 12-inch end laps and shall be fastened as recommended by the metal roofing system manufacturer.

Roofing Panels:

The roofing panels shall be installed and fastened in accordance with the details shown on the plans and the approved working drawings. Cutting and fitting shall present a neat and true appearance with exposed burrs removed. Openings through roof panels shall be cut square and shall be reinforced as recommended by the metal roofing system manufacturer.

The roofing panels shall be adjusted in place and properly aligned for the detailed conditions before fastening. Panels shall not be warped, bowed or twisted. The surface finish on the panels shall not be cracked, blemished or otherwise damaged.

Fasteners shall not be driven through roof panels or batten covers.

Miscellaneous Metal Shapes:

Trim, fascia, flashings, gutters, downspouts, scuppers, caps, and other prefinished metal work shall be positioned to the correct alignment for each detailed condition. Metal work shall be securely attached to backing construction using fasteners at the spacing shown on approved working drawings.

Metal panels, trim, gutters, and other prefinished metal that are marred, punctured, incorrectly bent, or incorrectly installed will be considered damaged and shall be replaced with undamaged units.

Expansion joints shall conform to the manufacturer's recommendations and to SMACNA "Architectural Sheet Metal Manual."

The metal panel system shall be installed watertight. Closures shall be tight fitting and shall be provided at the ends of panels, at the boundary of the roof, and as indicated on the approved working drawings.

CLEAN UP AND CLOSE OUT

Clean up:

Adjacent surfaces shall be protected during the roofing system installation and sealant work. Excess sealant shall be removed as the installation progresses.

Roof panels, molding, trim, and other prefinished metal surfaces shall be cleaned after installation as recommended by the manufacturer. Exposed cuts shall be touched-up with a matching durable primer and paint as recommended by the metal roofing system manufacturer.

Touch up: Damaged paint surfaces shall be touched up by using an air dry touch up paint supplied by the metal roofing system manufacturer. Only a small brush shall be used for touching up. No spraying of touch up paint is to be performed.

Damaged Units: Panels and other components of the work which have been damaged or have deteriorated beyond successful repair shall be removed and replaced.

12-7.09 METAL ROOFING, STEEP SLOPE

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing preformed metal roofing in accordance with the details shown on the plans and these special provisions.

Metal roofing system shall consist of underlayment, prefinished metal roof panels, gutters, downspouts, concealed fasteners, sealants, and other accessories and components, not mentioned, which are required for a complete, securely fastened and watertight installation.

SYSTEM DESCRIPTION

Design Requirements: The roofing system shall conform to the wind design requirements for uplift in Chapter 16 of the 2010 CBC and per ASCE 7-05 for the wind speed and exposure calculations shown on the plans.

Roofing product shall meet the requirements of the 2007 California Energy Code Section 118 (i) and Section 143 (a) 1.A. Such product shall be tested and labeled by the Cool Roof Council (CRRC) to have a minimum 3-year aged solar reflectance of 0.55, and a minimum 3-year aged thermal emittance of 0.75. If CRRC testing for 3-year aged reflectance is not available for any product, the 3-year aged value may be derived per Section 118 (i) 2. of the California Energy Code.

SUBMITTALS

Product Data:

Manufacturer's technical product data, installation instructions, and recommendations for each type of roofing material shall be submitted for approval.

Product data shall include the manufacturer's name and a complete material description of all components of the metal roofing system.

Samples:

Material samples shall include a 12" x 12" sample of the roofing panel for each color to be installed and a sample of each anchor clip and fastening device.

Working Drawings:

Working drawings showing the layout and details of the metal roofing shall be submitted for approval.

Working drawings shall show the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; details of connections and closures; and details for expansion joints and watertight joints.

Design calculations for the fastening system with the substrate shown on the plans shall be submitted to verify compliance with the design requirements. Provide Wind Uplift calculations per ASCE 7-05 specific to the project locations and conditions and indicating panel clip attachment and spacing requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer's signature shall be original.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of compliance shall be furnished for the metal roofing system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Warranty: The roof manufacturer shall provide a 20-year warranty for watertightness that included all flashings, trims, and penetrations. The same manufacturer shall provide the standing seam metal roof system and metal siding system to provide the Engineer with a single source of liability against leaks for a period of 20 years. The Installer shall provide a four year workmanship warranty to the manufacturer. Weathertight warranties are not acceptable.

Manufacturer's Inspections: The roofing system manufacturer shall perform jobsite inspections minimum 2 days per week. Inspection shall provide inspection reports with photographs to the Engineer as to the quality and progress of the workmanship being performed.

Performance Standard System shall be in accordance with these minimum standards:

a. Independent Test Results: ASTM E-1680-95, Static Pressure Air Infiltration of Roof Panels

Pressure	**Leakage Rate**
1.57 psf	0.0012 cfm/sq.ft.
6.24 psf	0.0001 cfm/sq.ft.
20.0 psf	0.0011 cfm/sq.ft.

b. Independent Test Results: ASTM E-1646-95, Static Pressure Infiltration of Roof Panels

Pressure	**Leakage Rate**
5 gallon/hr.per sf.and static Pressure of 20.0 psf. for 15 minutes	No Leakage

c. Water penetration (dynamic pressure): No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than 5 minutes duration, when tested in accordance with principles of AAMA 501.1.

DELIVERY, HANDLING AND STORAGE

Delivery and Handling: Panels shall be protected against damage and discoloration.

Storage: Panels shall be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

PART 2 - PRODUCTS

MATERIALS

Specifications are based on the R-Mer Span standing seam metal roof system as manufactured by the Garland Company and form the basis of design and indicate a standard of performance. Other manufacturers: provided they meet all specification requirements are Centria, Overly, or pre-approved equal.

SHEET MATERIAL

Provide standing seam panels incorporating mechanically interlocked, concealed anchor clips allowing unlimited thermal movement and of configuration which will prevent entrance or passage of water.

Base Metal: Base metal shall be cold formed, 22-gage, galvanized sheet steel conforming to ASTM Designation: A 653/A 653M, Grade 33 [230] with G90 [Z275] coating, except where a higher strength is required for performance, extra smooth; or cold formed aluminum-zinc alloy-coated, commercial quality, sheet steel conforming to ASTM Designation: A 792/A 792M, Grade 40 [275] with AZ55 [AZM 165], coating extra smooth.

Panel/Cap configuration must have a total of four (4) layers of steel surrounding the anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.

Profile of panel shall have mesas every two (2) inches on center continuous throughout panel, which are a minimum of one and one half (1-1/2) inches wide.

Exposed fasteners, screws and or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required) and trim details (as per manufacturers' guidelines).

Provide panels in continuous length from ridge to eave with no overlaps unless approved by manufacturer in writing.

Panel lengths which exceed maximum shipping length shall be field rolled on equipment owned by the panel manufacturer. Seam sealant must be factory applied.

Seam caps shall be manufactured in the factory and may be installed with end laps. Seam sealant must be factory applied.

Seam must be two and three-eighths (2-3/8) inches height for added upward pressure and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral seams are unacceptable.

Concealed anchor: Provide anchors of continuous length with a zero point zero six two (0.062) inches minimum thickness of extruded aluminum alloy 6005-T5, with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.

Anchor shall provide non-penetrating, concealed engagement at the panel seam in a manner similar to the standard anchor clips.

Sealant applied in panel cap must be isolated from anchor to insure that no sealant damage occurs from the movement of the panel during expansion and contraction.

Anchor must maintain a clearance of minimum of three-eighths (3/8) inches between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.

Seam Cap: Snap on cap shall be minimum of 1" wide "T" shaped of continuous length up to forty-five (45) feet according to job conditions and field seamed by means of manufacturers' standard seaming machine.

Cap shall be designed to receive two (2) beads of continuous hot applied gasket sealant which will be applied independent of anchor clip to allow unlimited thermal movement of panel without damage to cap sealant.

Sealant shall be SIS (Styrene-Isoprene-Styrene) block copolymer type thermoplastic rubber adhesive, not fatigue water barrier.

Standing Seam Pane Width: 12"

Panel ends shall be panned at ridge, headwall and hip conditions or where applicable.

Panel length: Full length without joints, including bends.

METAL FINISHES

Coatings shall be applied before or after forming and fabricating panels, as required for maximum coating performance capability.

Colors or color matches shall be as shown on the plans or, if not otherwise shown, shall be as selected by the Engineer from the manufacturer's standard color palette.

Fluoropolymer Coating:

Finish shall be the manufacturer's standard Kynar coating with a baked on primer (0.25-0.35-mil) and a finish coat of 1.0-mil nominal for a total dry film thickness of approximately 1.25 to 1.35 mils-mil nominal.

Interior finish and unexposed surfaces for coated panels shall be backed-on polyster coating with 0.20-0.30 mils dry film thickness (DFT).

MISCELLANEOUS METAL SHAPES

Flashings, Gutters, Scuppers, and Downspouts: Flashings, gutters, scuppers, and downspouts shall be formed from the same material, gage and in the same finish as the roofing panels.

MISCELLANEOUS MATERIALS

Gable Anchor Clips: Standing Seam Style, galvalume steel, type AZ-55, minimum thickness 16 gauge.

Fastener Clips: Fastener clips shall be concealed non-corrosive clips.

Fasteners: Fasteners shall be as recommended by the metal roofing system manufacturer. Sheet metal screws shall not be used except to fasten trim and flashings.

Underlayment: Underlayment shall be 30 mil thick and composed of butyl rubber based adhesive backed by a layer of high density cross laminated polyethylene. The underlayment must be backed self healing, with slip resistant surface and resist temperatures up to 300 degrees. Maximum exposure of 60 days. Must meet ASTM D-3767 Method A, ASTM D-412, ASTM D-903, ASTM E-96, ASTM D-461 and ASTM D-1970 provided by roof system manufacturer for complete warranty system.

Sealant and Sealant Tape: Adhesive backed butyl rubber by a large of high density cross laminated polyethylene.

Closures: Closures shall be Factory precut closed cell foam meeting ASTM D1056 or ASTM D3575 and enclosed in metal channel matching panels when used at hip, ridge, rake and jamb.

FABRICATION

Unless otherwise shown on the plans, or specified herein, roof panels shall be fabricated in continuous lengths for the length of the roof, from ridge or peak to eave, except such length shall not exceed the manufacturer's maximum production length. Flashings shall be fabricated in the longest practical lengths.

Roofing panels shall be factory formed. Field formed panels are not acceptable.

PART 3 - EXECUTION

INSTALLATION

Underlayment: The roof panels shall be installed over underlayment. Underlayment shall be laid parallel to the eaves, shingle fashion with 6-inch edge laps and 12-inch end laps and shall be fastened as recommended by the metal roofing system manufacturer.

Roof Panels:

The roof system shall be installed and fastened in accordance with the details shown on the plans and the approved working drawings. Cutting and fitting shall present a neat and true appearance with exposed burrs removed. Openings through roof panels shall be cut square and shall be reinforced as recommended by the metal roofing system manufacturer.

Roof panels shall be adjusted in place and properly aligned for the detailed conditions before fastening. Panels shall not be warped, bowed or twisted. The surface finish on the panels shall not be cracked, blemished or otherwise damaged.

Gaskets, joint fillers, sealants and sealing tape shall be installed where indicated on the approved drawings or as required for waterproof performance of panel systems.

Fasteners shall not be driven through roof panels or batten covers.

Miscellaneous Metal Shapes:

Trim, fascia, flashings, gutters, downspouts, scuppers, caps, and other prefinished metal work shall be positioned to the correct alignment for each detailed condition. Metal work shall be securely attached to backing using fasteners at the spacing shown on approved working drawings.

Roof panels, trim, gutters, and other prefinished metal that are marred, punctured, incorrectly bent, or incorrectly installed will be considered damaged and shall be replaced with undamaged units.

Gutters shall be fabricated by the metal roofing system manufacturer to the shape and lengths shown on the plans. Expansion joints shall conform to the manufacturer's recommendations and to SMACNA "Architectural Sheet Metal Manual," 6th edition.

The metal roofing system shall be installed watertight. Closures shall be tight fitting and shall be provided at the ends of panels, at the boundary of the roof, and as indicated on the approved working drawings.

CLEAN UP AND CLOSE OUT

Clean up:

Adjacent surfaces shall be protected during the roofing system installation and sealant work. Excess sealant shall be removed as the installation progresses.

Roof panels, molding, trim, and other prefinished metal surfaces shall be cleaned after installation as recommended by the manufacturer. Exposed cuts shall be touched-up with a matching durable primer and paint as recommended by the metal roofing system manufacturer.

Touch up: Damaged paint surfaces shall be touched up by using an air dry touch up paint supplied by the metal roofing system manufacturer. Only a small brush shall be used for touching up. No spraying of touch up paint is to be performed.

Damaged Units: Panels and other components of the work which have been damaged or have deteriorated beyond successful repair shall be removed and replaced.

12-7.10 METAL SIDING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing factory formed, prefinished, single skin concealed fastener metal siding panels, in accordance with the details shown on the plans.

Metal siding system shall consist of underlayment, prefinished metal siding panels, and accessories and components, not mentioned, which are required for a complete, securely fastened and weathertight installation.

REFERENCES

General reference latest edition of applicable codes and standards.

American Society of Testing and Materials (ASTM):

ASTM A653 Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process.

ASTM C236 Standard Specifications for Steady-State Thermal Performance of Building Assemblies by means of a Guarded Hot Box.

ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

American Iron and Steel Institute (AISI):

Specifications for the Design of Cold-Formed Steel Structural Members.

American Institute of Steel Construction (AISC):

Code of Standard Practice

American Society of Civil Engineers (ASCE):

ASCE-7, Minimum Design Loads for Buildings and Other Structures.

SYSTEM DESCRIPTION

Design Requirements: The siding system shall conform to the wind design requirements for uplift or outward pressures in accordance with Chapter 16 of the 2010 CBC for the wind speed and exposure shown on the plans.

Peformance Requirements:

Metal siding panels shall be designed for a maximum deflection under loading of L/180.

Air Infiltration of the metal siding panel system shall be limited to 0.0006 CFM/ft^2 at a positive pressure differential of 1.57 psf when tested in accordance with ASTM E283.

There shall be no uncontrolled water penetration to the building interior when the metal siding panel system is tested per ASTM E331 at a positive pressure differential of 6.24 psf or 20% of the design wind pressure whichever is greater. The test pressure need not exceed 12 psf.

Metal siding panel system shall be tested for thermal transmittance in accordance with ASTM C236.

SUBMITTALS

Product Data:

Manufacturer's technical product data, installation instructions, test reports, and certifications shall be submitted for approval.

Product data shall include the manufacturer's name and a complete material description of all-components of the metal siding system.

Samples:

Material samples shall include a 12" x 12" sample of the metal siding panels for each color to be installed and a sample of each anchor clip and fastening device.

Working Drawings:

Working drawings showing the layout and details of the metal siding system shall be submitted for approval.

Working drawings shall include the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; details of connections and closures; and details for expansion joints and weathertight joints. Submit small-scale layouts of metal siding panels and large scale details of edge conditions, joints, fastener and sealant placement, flashings, penetrations and special details. Distinction must be made between factory and field assembled work.

Design calculations for the metal siding system must be submitted in accordance with the AISI Specification for the Design of Cold Formed Steel Structural Members, for Metal Wall Panel Systems. Provide Wind Uplift calculations per ASCE 7-05 specific to the project and indicate that all safety factors and wind loads are met.

The fastening system of the metal siding panels with the substrate shown on the plans shall be submitted to verify compliance with the design requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer’s signature shall be original.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of compliance shall be furnished for the metal siding system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Manufacturers Qualifications: The manufacturer shall have had a minimum of ten (10) years experience in the successful completion of projects employing similar materials, applications, and performance requirements.

Installers Qualifications: The metal siding system contractor shall have had a minimum of ten (10) years experience in the successful completion of projects employing similar materials, applications, and performance requirements.

Warranties:

Material Warranty: Manufacturer to provide 20 year limited weathertight warranty that includes all flashings, trims, penetrations, and underlayment to provide a full system warranty. Installer to provide 4 year workmanship warranty. The same manufacturer shall provide the standing seam metal roof system and metal siding system to provide the Owner with a single source of liability against leak for a period of 20 years.

Paint Finish Warranty: The manufacturer shall warrant against fading, chalking, peeling, cracking, checking, chipping, or erosion to base metal of the exterior panel finish, in accordance with the paint suppliers standards.

Manufacturer's Inspections: The wall panel system manufacturer will perform jobsite inspections minimum two (2) days per week. The manufacturer will provide weekly inspection reports with photographs to the Engineer informing them of the progress of the workmanship being performed.

DELIVERY, HANDLING AND STORAGE

Delivery and Handling: Metal siding panels shall be protected against damage and discoloration.

Storage: Metal siding panels shall be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

PART 2 - PRODUCTS

MATERIALS

Steel Panels: Minimum 22 gauge, G90 Galvanized steel. Must Conform to ASTM A653-96 Grade A Structural Quality.

Configuration: Interlocking standing seam panels incorporating concealed anchor clips.

No exposed fastener panel systems are acceptable. Basis of Design is Garland R-Mer Loc Wall Panel System. Other acceptable manufacturers are Centria and Overly. All systems must meet all the requirements of the specification or be rejected.

Panel width: 12".

Panel length: Full length without joints.

Profile of Wall Panels will be 1 3/4" tall seam with striations and allow for unlimited expansion and contraction of panels. Panel will have 3/8" high clearance between the panel and the substrate for proper ventilation.

Metal Subgirt System: Provide 16 gauge galvanized steel furring channels for use as panel subgirt system for panel attachment.

Fasteners: Provide TYPE 304 Stainless Steel fasteners, of size and quantity as required to resist negative pull-off and meet structural requirements of the panel system.

All exposed metal flashing and trim shall be fabricated of same material, gauge, finish and color as siding

Weatherseals: Provide at all panel to panel joints and panel perimeter joints, a silicone joint sealant. Acceptable silicone sealant manufactures are Dow Corning or General Electric or as approved by wall panel manufacturer. Instant sealant in accordance with sealant manufacturer's recommendations. Sealant manufacturer shall provide owner with standard 20 warranty.

METAL FINISHES

Coatings shall be applied before or after forming and fabricating panels, as required for maximum coating performance capability.

Colors shall match color of Metal Roofing, Steep Slope.

Fluoropolymer Coating:

Finish shall be 0.80 primer, 0.80 mil 70% Polyvinylidene Fluoride (PVDF) Color Coat, and 0.80 mil. PVDF Clear Coat. Stucco Embossed

Interior finish shall be backed-on polyster coating with 20-30 dry film thickness (DFT) consist of a 0.15 -mil epoxy primer and a backer coat.

MISCELLANEOUS MATERIALS

Fastener Clips: Fastener clips shall be concealed 18 gauge galvanized steel clips.

Fasteners: Fasteners shall be as recommended by the metal siding system manufacturer. Sheet metal screws shall not be used except to fasten trim and flashings.

Underlayment: Underlayment shall be moisture permeable, water shedding, wind resistant, UV stabilized, rot proof and tear resistant. Must be approved and provided by the wall panel manufacturer to meet the warranty requirements.

Sealant and Sealant Tape: Adhesive backed butyl rubber backed by a larger of high density cross laminated polyethylene.

Closures: Closures shall be prefinished perforated metal.

FABRICATION

Flashings shall be fabricated in the longest practical lengths.

Metal siding panels shall be factory formed. Field formed panels are not acceptable.

PART 3 - EXECUTION

INSTALLATION

Underlayment: The metal siding panels shall be installed over underlayment. Underlayment shall be laid with 6-inch edge laps and 12-inch end laps and shall be fastened as recommended by the metal siding system manufacturer.

Metal Siding Panels:

The metal siding panels shall be installed and fastened in accordance with the details shown on the plans and the approved working drawings. Cutting and fitting shall present a neat and true appearance with exposed burrs removed. Openings through metal siding panels shall be cut square and shall be reinforced as recommended by the metal siding system manufacturer.

Metal siding panels shall be adjusted in place and properly aligned for the detailed conditions before fastening. Panels shall not be warped, bowed or twisted. The surface finish on the panels shall not be cracked, blemished or otherwise damaged.

Miscellaneous Metal Shapes:

Trim, caps, and other prefinished metal work shall be positioned to the correct alignment for each detailed condition. Metal work shall be securely attached to backing construction using fasteners at the spacing shown on approved working drawings. Prefinished metal to be installed over concrete, masonry or plaster shall be back-coated with asphaltic paint as recommended by the manufacturer.

Metal siding panels, trim, and other prefinished metal that are marred, punctured, incorrectly bent, or incorrectly installed will be considered damaged and shall be replaced with undamaged units.

Expansion joints shall conform to the manufacturer's recommendations and to SMACNA "Architectural Sheet Metal Manual."

The metal siding panel system shall be installed weathertight. Closures shall be tight fitting and shall be provided at the ends of panels, at the boundary of the roof, and as indicated on the approved working drawings.

CLEAN UP AND CLOSE OUT

Clean up:

Adjacent surfaces shall be protected during the metal siding panel system installation and sealant work. Excess sealant shall be removed as the installation progresses.

Molding, trim, and other prefinished metal surfaces shall be cleaned after installation as recommended by the manufacturer. Exposed cuts shall be touched-up with a matching durable primer and paint as recommended by the metal siding system manufacturer.

Touch up: Damaged paint surfaces shall be touched up by using an air dry touch up paint supplied by the metal siding roofing system manufacturer. Only a small brush shall be used for touching up. No spraying of touch up paint is to be performed.

Damaged Units: Panels and other components of the work which have been damaged or have deteriorated beyond successful repair shall be removed and replaced.

12-7.11 METAL PANEL COLUMN COVERS, FASCIA AND SOFFIT

PART 1.- GENERAL

SUMMARY

Scope: This work shall consist of designing, fabricating, furnishing and installing metal panels on the columns, fascia and soffit as shown on the plans and these special provisions.

QUALITY ASSURANCE

Manufacturers Qualifications: The manufacturer shall have had a minimum of ten (10) years experience in the successful completion of projects employing similar materials, applications, and performance requirements.

Installers Qualifications: The Wall Systems contractor shall have had a minimum of five (5) years experience in the successful completion of projects employing similar materials, applications, and performance requirements.

Warranties:

Material Warranty: The Manufacturer shall warrant that the materials and accessories furnished in accordance with these specifications shall remain free from defects in material and factory workmanship for a period of two (2) years from date of shipment.

Paint Finish Warranty: The manufacturer shall warrant against fading, chalking, peeling, cracking, checking, chipping, or erosion to base metal of the exterior panel finish, in accordance with the paint suppliers standards.

SUBMITTALS:

Product Data:

Manufacturer's technical product data, installation instructions, and recommendations for each type of metal panel shall be submitted for approval.

Product data shall include the manufacturer's name and a complete material description of all components of the metal panel system.

Samples:

Five samples for each type of panel and anchorage devices shall be submitted for approval.

Panel samples shall be approximately 12 inch x 12 inch in size and shall have the finish color of the exterior panel surface.

Working Drawings:

Working drawings showing the layout and details of the metal panel system shall be submitted for approval.

Working drawings shall show the shape, size, thickness, and method of attachment for each component used in the work; the layout and spacing of fasteners; details of connections and closures; and details for expansion joints and weathertight joints.

Design calculations for the fastening system with the substrate shown on the plans shall be submitted to verify compliance with the design requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The Engineer’s signature shall be original.

The engineering calculations for the design of the metal panel system shall include applied loads, load combinations, panel stresses and deflections, fastener loads and stresses and provisions for accommodating the canopy deflections.

Design Requirements:

Composite metal panels shall conform to the wind design requirements for uplift in Chapter 16 of the California Building Code for the wind speed and exposure shown on the plans.

DELIVERY, HANDLING AND STORAGE

Delivery and handling: Panels shall be protected against damage and discoloration.

Storage: Panels shall be stored above ground, with one end elevated for drainage and protected against standing water and condensation between adjacent surfaces.

PART 2.- PRODUCTS

MATERIALS

SHEET MATERIAL

Aluminum panels: Panels shall be custom fabricated solid aluminum plate, 5052-H32 AQ alloy, with minimum thickness of 1/8 inch. Fabrication shall include forming return flanges, welding corners, and grinding all welds smooth.

Metal panel subgirt system: shall be 16-gage galvanized steel furring channels for use as panel subgirt system for panel attachment.

Fasteners: Fasteners shall be cadium plated Type 304 stainless steel fasteners, of size and quantity as required to securely attach the panel system.

MISCELLANEOUS MATERIALS

Underlayment: Underlayment shall be 30 mil. Butyl rubber based adhesive backed by a layer of high density cross laminated polyethylene. Vapor Barrier, self healing, slip resistant. Must resist temperatures up to 300 degrees. Maximum exposure of 60 days. Must meet ASTM D-1970.as recommended by the metal roofing system manufacturer, but not less than 15-pound minimum asphalt impregnated fiber glass mat roofing felt.

Sealant: Sealant shall be one-part, low modulus, weatherproofing silicone, Dow Corning Corporation, 795 Silicone Building Sealant; General Electric Company, Silpruf Sealant; or equal and shall be as recommended by the metal panel manufacturer.

Backer rod: Backer rod shall be round closed cell polyurethane that is compatible with the sealant used and shall be sized such that it must be compressed between 25 and 75 percent of its compressed diameter when inserted in the joint.

Bond breaker: Bond breaker shall be pressure sensitive adhesive polyurethane tape.

METAL FINISHES

Finish shall be prepainted galvalume primer, 0.80 mil PVDF Color Coat, and 0.50 mil PVDF Clear Coat.

Finish shall be applied in accordance the paint manufacturer’s specifications. Paint finish applicator shall be licensed and approved by the paint manufacturer.

To minimize adjacent panel color variations or metallic flop, complete exterior elevations shall be finished from the same paint batch, and finished in the same production run.

EXECUTION

The alignment and dimensions of the steel members of the canopy shall be verified prior to commencing installation of the metal panel system.

The metal panel system shall be installed rigidly and securely in accordance with the manufacturer's recommendations and the approved working drawings.

Extreme care shall be exercised in handling, storing, moving and installation the metal panels to avoid twisting, racking, scratching, denting, chipping, staining or any other type of damage or distortion. Panels damaged in handling or installing shall be replaced by the Contractor at his expense.

Panels shall be accurately positioned to maintain the straight joint lines between panels as shown on the plans. Joints shall be kept uniform throughout the installation and shall be of sufficient width to accommodate the expansion and contraction of the panels but shall not exceed 1/2 inch in width.

Adjoining panels shall be aligned and matched to one another at the joints. The surfaces at the edges of each panel shall be flush with the surfaces at the edges of the adjacent panels.

Openings through the panels for penetrations shall be cut square to present a neat and true appearance with exposed burrs, removed. Openings shall be reinforced and sealed as recommended by the panel manufacturer.

A dry gasket shall be the primary method to seal joints. The dry gasket shall be compatible with silicone sealants.

Other surfaces necessary to use sealants, shall be clean and shall be free of dust, dirt oil, moisture and other deleterious matter which might adversely affect the adhesion of the sealant. Primer shall be applied in accordance with the sealant manufacturer's instructions. Application of backing materials and sealant shall be in accordance with the panel manufacture's working drawings and the sealant manufacturer's instructions, all as specified under Submittals," in these special provisions.

Joints to be sealed shall be inspected for construction defects which would adversely affect the execution of the work. Unsatisfactory conditions shall be corrected before the joint sealant is applied.

The installation metal panel system shall be weathertight.

The metal panel system shall be thoroughly cleaned after installation to remove excess sealant, tapes, dirt, grease or other unsightly materials. Cleaning shall be in accordance with the panel and sealant manufacturer's instructions.

A representative of the panel manufacturer shall be present during the panel installation.

The metal panel system shall be installed in accordance with the approved working drawings and the manufacturer's printed installation instructions.

All panel fabrication shall be preformed at the manufacturer's facility.

All required support clips and continuous subgirts shall be installed for a complete and adequate panel attachment. All panels shall be attached with concealed fasteners.

Panels surfaces in contact with cementitious materials or other dissimilar materials shall be separated with bituminous paint or non-metallic shims.

The maximum offset from true alignment of adjacent panels installed butting or in line shall be 1/16 inch maximum.

Panel to panel joints shall not vary more than 1/16 inch of the joint size indicated on the working drawing.

12-7.12 SHEET METAL FLASHING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of fabricating, furnishing and installing sheet metal flashing in accordance with the details shown on the plans and these special provisions.

Section Includes: Sheet metal shall include metal flashings, counterflashings, straps, gutters, downspouts, roof jacks, gravel stops, reglets, copings, scuppers, conductor heads, and screen type vents.

Alternatives: Premolded roof flashings may be used in lieu of sheet metal flashings where shown on the plans.

SUBMITTALS

Product Data: Submit manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

Samples for Initial Selection Purposes: Submit manufacturer's color charts and texture variations for specified sheet materials to be exposed as finished surfaces.

QUALITY ASSURANCE

Installer Qualifications: Engage an experienced installer who has completed flashing, sheet metal, and trim work similar in material, design, and extent to that indicated for project that have resulted in construction with a record of successful in-service performance.

Codes and Standards:

Sheet metal work shall in accordance with the requirements in the latest edition of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "Standard Practice in Architectural Sheet Metal Work."

International Nickel Company: "Stainless Steel Roofing, Flashing and Accessories Volume 3."

Wind Resistance: Fabricate and install flashings at edges of roof in accordance with FM Loss Prevention Data Sheet 1-49 for specified wind zone. Ensure that substrate construction is also in compliance.

Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Temperature Change Range: 100ºF, ambient; 150ºF material surfaces.

PART 2 - PRODUCTS

MATERIALS

General: Unless otherwise indicated, provide:

Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Class AZ-50 coating, grade 40, or to suit project conditions, with 55 percent aluminum, not less than 0.0336 inch thick; mill finish.

Extruded Aluminum: Extruded aluminum shall be the manufacturer's standard extrusions of sizes and profiles required. High-Performance Organic Finish: AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

Sheet Aluminum: Sheet aluminum shall be not less than 0.032 inch thick, mill finish, 3003-H14 alloy, conforming to ASTM Designation: B 209M.

Sheet Lead: Sheet lead shall be not less than 0.062 inch thick, conforming to ASTM Designation: B 749.

Premolded Roof Flashing: Premolded flashing shall be premolded neoprene or ethylene propylene diene monomer (EPDM) flashing, resistant to ozone and ultraviolet. Units shall have overlapping tab to flash the seam.

Hardware and Fastenings: Hardware and fastening for premolded roof flashings shall be stainless steel.

REGLETS

General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

Surface Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

Masonry Type: Provide with offset top flange for embedment in masonry mortar joints.

Counterflashing Wind-Restraint Clips: Provide hold down clips with 1/2 inch kickout to be installed before counterflashing to prevent wind uplift on the counterflashing lower edge. Fabricate the clips of the following materials:

Galvanized Steel: 22 gage; 0.0336 inch thick.

MISCELLANEOUS MATERIALS AND ACCESSORIES

Solder: Solder shall conform to ASTM Designation: B 32, Alloy Grade Sn50.

Solder for Stainless Steel: ASTM B32; provide 60% tin- 40% lead solder, with acid-chloride type flux, except use rosin flux over tinned surfaces.

Soldering Flux: Soldering flux shall be acid type, conforming to Federal Specification: O-F-506C, Type I, Form A.

Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

Installation Accessories: Provide joint tape, adhesives, sealers, and fasteners as recommended by flashing manufacturer for indicated applications.

Insect Screen: Insect screen shall be industrial wire cloth and screen, medium grade, 18 mesh, 0.017-inch diameter, 0.039-inch openings, plain weave, galvanized steel conforming to ASTM Designation: E 437.

Lap Joint Sealant: Lap joint sealant for concealed locations shall be a non-drying butyl.

Flashing Cement: Flashing cement shall be a bituminous plastic cement, asbestos free, conforming to ASTM Designation: D 4586, Type II.

Sealant: Sealant for exposed locations shall be a silicone sealant conforming to ASTM Designation: C 920.

Primer: Primer shall be as recommended by the sealant manufacturer.

Coal Tar Paint: Coal tar paint shall be coal-tar epoxy coating conforming to U.S. Corps of Engineers Specification: C-200 or Steel Structures Painting Council Paint Specification: SSPC-16-68T.

FABRICATION, GENERAL

Sheet metal shall be fabricated to Sheet Metal and Air Conditioning Contractors National Association Standards.

Sheet metal shall be formed to the sizes, shapes and dimensions shown on the plans or as specified herein with angles and lines straight, sharp and in true alignment. The number of joints shall be kept to a minimum. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal flashing and trim work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

Angle bends and folds for interlocking the metal shall be made with full regard for expansion and contraction to avoid buckling or fullness in the metal after it is installed.

Joints in sheet metal work shall be closed watertight unless slip joints are specifically required. Watertight joints shall be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Watertight joints in aluminum or between aluminum and other metals shall be sealed with acrylic sealant.

Sheet metal joints to be soldered shall be cleaned with steel wool or other means, pre-tinned and soldered watertight.

All joints shall be wiped clean of flux after soldering. Acid flux shall be neutralized by washing the joints with sodium bicarbonate.

Flashings shall have a 45 degree drip return at bottom edges. Unless otherwise shown on the plans, counterflashing shall extend not less than 4 inches over roofing or other materials protected by the counterflashing and shall be arranged so that roofing or materials can be repaired without damage to the counterflashing. Where reglets are indicated, counterflashing shall be fastened by lead wedges or snap-in flashing.

Roof penetrations: stainless steel type 304, vandal proof, provide isolators to avoid contact between dissimilar metals.

SHEET METAL FABRICATIONS

General: Unless otherwise indicated and as a minimum, fabricate flashings using materials in the thickness listed for each flashing application.

Exposed Flashings-Low Slope Roofs or Waterproofing: Formed copings, gravel stops and scuppers: Aluminum-Zinc Alloy-Coated Steel Sheet: 24 gage (0.0276 inch).

Semiconcealed Flashings-Low Slope Roofs or Waterproofing: Counter flashing, reglets, equipment support flashing, roof area joint and roof expansion joint covers and pipe/conduit penetration flashing: Aluminum-Zinc Alloy-Coated Steel Sheet: 24 gage (0.0276 inch).

Miscellaneous Flashings: Aluminum-Zinc Alloy-Coated Steel Sheet: 24 gage (0.0276 inch).

PART 3 - EXECUTION

Preparation: Surfaces to receive sheet metal shall be clean, smooth and free from defects.

Protection: Aluminum surfaces to be in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

INSTALLATION

Roof Penetration Flashings:

All pipes, ducts, vents and flues passing through roofs shall be made waterproof with flashings of storm collars or counterflashings.

Roof penetration flashings shall be fabricated from stainless sheet steel, not less than 24-gage. Size and shape shall be as shown on the plans.

The lower flashing shall be stainless steel sheet metal, 24-gage, and extend 6 inches minimum from outside of the pipe in all directions and 1½ inches above the top of the roofing.

The top flashing shall be stainless sheet steel or sheet lead as shown on the plans.

Gutters:

Gutters shall be size and shape as shown on the plans. Where shown, provide gutters of profiles and dimensons shown.

Gutters shall be fabricated in sections not less than 10 feet in length. Use sections as long as practicable for lengths over 10 feet.

Joints shall be lapped at least 1½ inches, rivet and solder watertight. Butt type expansion joints, ¾ inch wide, shall be provided at midpoint between down spouts and where expansion joints occur in the structure.

Downspouts:

Downspouts shall be installed as shown on the plans, secured to the wall with straps near top, bottom and at intermediate points not more than 8 feet apart. Straps shall extend 2 inches out on wall and be secured with suitable anchors.

Unless otherwise shown on the plans, the lower end of downspout shall terminate with mitered 45 degree elbow.

Rain Chains: 2 inch oval double loop; 9 gage copper; soldered joints; with manufacturer's gutter hole bolt accessory.

Premolded Roof Flashings: Premolded roof flashings shall be installed in accordance with the manufacturer's instructions.

12-7.13 ROOF ACCESSORIES

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing roof specialties in accordance with details shown on the plans and these special provisions.

Section Includes: Hatch-type heat and smoke vents, dome-type heat and smoke vents, roof hatches (scuttles), prefabricated ridge ventilators, and prefabricated curb and equipment support units.

Related Sections:

Ridge vents for steep-slope roofing are specified in steep-slope roofing Sections in Section 12-7 "Thermal and Moisture Protection," of these special provisions.

Shop and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories are specified under "Sheet Metal Flashing" in Section 12-7 "Thermal and Moisture Protection," of these special provisions.

Small individual skylights are specified under "Unit Skylights" in Section 12-7 "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS

Product Data: Manufacturer's descriptive data, rough-in diagrams, installation instructions and general product recommendations shall be submitted for approval.

Samples: Five samples, minimum 8 inches square, of each exposed metal and plastic sheet materials, and 2 samples, minimum 24 inches long, of formed or extruded metal member each color and finish specified shall be submitted for approval.

Coordination Drawings: Coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping or conduit, shall be submitted for approval. Drawings shall indicate dimensions and locations of items provided in this special provision, together with relationship and methods of attachment to adjacent construction and to mechanical and electrical items.

QUALITY ASSURANCE

Labels: Units shall be provided which have been tested, listed, and bear the label of UL, FM or other recognized testing agency.

Standards:

Prefabricated units shall conform to the requirements of SMACNA, "Architectural Sheet Metal Manual," details for fabrication of units, including flanges and cap flashing to coordinate with types of roofing involved.

International Nickel Company: "Stainless Steel Roofing, Flashing and Accessories Volume 3."

PART 2 - PRODUCTS

Manufacturer's standard units, modified as necessary, shall be provided to comply with the contract requirements. Each unit shall be shop fabricated to the greatest extent possible.

MATERIALS

Sheet Steel: Sheet steel shall be structural quality conforming to the requirements of ASTM Designation: A 570.

Aluminum-Zinc Alloy-Coated Steel Sheet : ASTM A792, Class AZ-50 coating, grade 40, or to suit project conditions, with 55 percent aluminum, not less than 0.0336 inch thick, unless otherwise indicated; mill finish.

Stainless Steel: Stainless steel shall conform to ASTM Designation: A 167, Type 302/304 or Type 316, with No. 4 finish. Stainless steel shall be tempered as required for forming and performance.

Aluminum Sheet: Aluminum sheet shall conform to the requirements of ASTM Designation: B 209, tempered as required, Duranar or Hynar finish, except furnish mill finish where field painting is required.

Extruded Aluminum: Extruded aluminum shall be the manufacturer's standard extrusions of sizes and profiles required.

High-Performance Organic Finish: AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight).

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

Copper Sheet: ASTM B370, cold rolled temper, 16 ounce weight, unless otherwise shown; or in lieu thereof, ASTM B465 light annealed temper, 0.015 in. thick may be used where 16 ounce material is specified.

Insulation: Insulation shall be the manufacturer's standard rigid or semi-rigid board of glass fiber and shall be the thickness required.

Fasteners: Fasteners shall be the same metal as the metal to be fastened, or other non-corrosive metal as recommended by the unit manufacturer. Finish of the fastener shall be the same finish as the metal being fastened.

Solder: Solder shall conform to ASTM Designation: B 32, Alloy Grade Sn50.

Solder for Stainless Steel: ASTM B32; provide 60 percent tin- 40 percent lead solder, with acid-chloride type flux, except use rosin flux over tinned surfaces.

Gaskets: Gaskets shall be tubular or fingered design of neoprene or polyvinyl chloride as recommended by the unit manufacturer.

PREFABRICATED HEAT/SMOKE VENTS

Units shall be custom fabricated only to the extent necessary for compliance with the dimensions shown on the plans or other requirements. External loading shall be not less than 40-pound live load per square foot and internal loading shall be not less than 20 pounds per square foot.

Units shall be fabricated from stainless steel, with manufacturer's standard one piece and two-piece welded or sealed mechanical corner joints, including cap flashing.

Curb shall be double wall construction with cant strips and one-inch insulation of height shown on plans or, unless otherwise noted, for mounting with height of 9 inches above line of roofing. Vents shall have roof flange for attachment to roof deck.

Where roof slopes more than 2 percent, tapered curb heights shall be furnished to match the slope and the resulting top of unit shall be level.

PREFABRICATED ROOF HATCH (SCUTTLE)

Roof scuttles shall be of sizes indicated, furnished complete with all necessary hardware and installation accessories. Curb and cover shall be fabricated from 14 gage stainless steel, and cover liner from a minimum 22 gage stainless steel. Provide cover with rubber draft seal. Cover insulation shall be glass fiber, minimum 1 inch in thickness.

Roof scuttle shall be galvanized, treated for paint adherence, and shop coated with an approved metal primer before delivery.

Provide roof scuttle complete with required operating hardware, including positive snap latch with turn handles and padlock hasps inside and outside. Hardware shall be stainless steel.

PREFABRICATED ROOF VENTILATOR

Roof ventilator shall be continuous, ridge type, gravity operated ventilator with integral base; equipped with positive closing, screw type adjustable damper, bird screen and end closures; ventilator width shall be greater than twice the throat width. Ventilator shall be fabricated from Aluminum-Zinc Alloy-Coated Steel Sheet not less than 24-gage.

Damper handle shall be removable, designed to extend to approximately 4 feet above the finished floor.

PREFABRICATED CURB AND EQUIPMENT SUPPORTS

Curb and equipment support shall conform to the loading and strength requirements of the equipment to be supported. Dimensions shall conform to the dimensions shown on the coordination drawings of equipment to be supported. Unit shall be fabricated from Aluminum-Zinc Alloy-Coated Steel.

Units shall be fabricated with welded or sealed mechanical corner joints, complete with cant strips and base profile coordinated with roof insulation thickness. Wood nailers shall be provided at top of curb tapered as necessary to compensate for roof slopes of 2 percent.

Where roof slope is more than 2 percent curb or equipment supports shall be fabricated with height tapered to provide a level installation.

COPING

Provide aluminum bull nose coping system. All exposed aluminum shall have Duranar or Hynar finish.

PART 3 - EXECUTION

INSTALLATION

Prefabricated units shall be installed in accordance with the manufacturer's instructions and approved coordination drawings.

Installation of the units shall be coordinated with installation of the roof decking and other substrates to receive accessory units, vapor barriers, insulation, roof and flashing materials.

Units shall be securely fastened to supporting members, adequate to withstand all lateral, inward or outward loading pressures.

Where metal surfaces are to be installed in contact with non-compatible metals or other corrosive substrates, including wood decking, bituminous coatings shall be applied to metal surfaces.

Except as noted above, roof flanges shall be set in a thick bed of roofing cement to form a watertight seal.

Operational Testing: Units with operational components shall be fully tested. Joints and hardware shall be cleaned and lubricated. All units shall be adjusted for proper operation.

CLEANING AND PROTECTION

All exposed metal and plastic surfaces shall be cleaned in accordance with the manufacturer's instructions. Damaged metal coatings shall be repaired.

12-7.14 UNIT SKYLIGHTS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing skylights in accordance with the details shown on the plans and these special provisions.

SYSTEM DESCRIPTION

Design Requirements:

Skylights shall conform to the requirements on Section 2610 of the CBC.

Skylights shall be rated by the manufacturer to withstand a 40 pounds per square foot live loading.

SUBMITTALS

Product Data: Manufacturer's descriptive data and installation instructions shall be submitted for approval.

Samples: A 26 inch by 26 inch sample of the acrylic plastic and the framing assembly shall be submitted for approval.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of compliance shall be furnished for the skylights in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2 - PRODUCTS

Skylight:

Skylight shall be factory assembled sealed pyrimid plastic skylight units; complete with extruded aluminum thermally broken frame system with integral drainable condensation gutters and counter flashing to roof curb.

Assembly U Value: 0.48.

Frame: Retaining and curb framing shall be 6063-T5 aluminum with mitered, full welded corners and condensation weeps to the outside.

Skylight shall be thermally broken. Triple glazing; separate glazing from framing; Solar Heat Gain Coefficient: 0.52; Visual Light Transmission: 0.48; EDPM rubber air seal gasket. Provide safety-security guard.

Finish: 3-coat Polyvinylidene fluoride (PVDF) conforming to AAMA 2605 "Superior Performing Organic Coatings on Aluminum Extrusions and Panels." Acceptable Finish Systems: Duranar XL , Hylar 5000, or equal.

PART 3 - EXECUTION

INSTALLATION

Coordinate unit skylight installation with installation of substrates, vapor retarders, roof insulation, roofing, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

Where metal surfaces of units will contact incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

Anchor unit skylights securely to supporting substrates.

Set unit skylight flanges in thick bed of roofing cement to form a seal, unless otherwise indicated.

Where cap flashing is indicated, install to produce waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant except where overlap is indicated to be left open for ventilation.

CLEANING

Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

12-7.15 JOINT SEALANT

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of preparing and placing a joint sealant in accordance with the details shown on the plans and these special provisions.

The sealed joint shall consist of tempered hardboard, expanded polystyrene and a pourable joint seal.

SUBMITTALS

Product Data: Manufacturer’s descriptive data, specifications and installation instructions shall be submitted to the Engineer at the jobsite for approval.

PART 2 - PRODUCTS

Tempered Hardboard: Tempered hardboard shall be 1/8-inch minimum thickness, commercial quality suitable for the use intended. Other facing materials may be used provided they furnish equivalent protection.

Expanded Polystyrene: Expanded polystyrene shall be commercially available polystyrene board.

Polyethylene Foam: Polyethylene foam shall be commercial quality, with a continuous, impervious, glazed top surface, suitable for retaining the liquid sealant in the joint while hardening.

Primer: Primer shall be as recommended by the sealant manufacturer.

Joint Sealant: Joint sealant shall be a commercial quality, 2 component polyurethane sealant, which shall be self-levelling and withstand up to 25 percent movement.

PART 3 - EXECUTION

PREPARATION

Forming:

Groove for joint seal shall be formed to a uniform width and depth and to the alignment shown on the plans or as ordered by the Engineer. The completed groove shall have a top width within 1/8 inch of the width shown on the plans and the bottom width shall not vary from the top width by more than 1/16 inch.

At least 24 hours prior to installing the joint seal, the Contractor shall repair all spalls, fractures, breaks, or voids in the concrete surfaces of the joint groove.

The lip of the joint shall be beveled by grinding as shown on the plans.

Cleaning:

Prior to sealing joints, expanded polystyrene, hardboard, concrete spillage and all foreign material shall be removed from the deck to the bottom of the formed joint.

Prior to placing the joint seal, the joint shall be cleaned by a method which shall include abrasive blast cleaning and then be cleaned with a high pressure air jets to remove all residue and foreign material.

INSTALLATION

Materials:

No material shall be used which has skinned over or which has settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.

Each container of material shall be clearly labeled or each delivery of material in the tanks of 2-component equipment shall be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, and date, if any, beyond which the sealant shall not be used.

Primer: A primer shall be applied to the sides of the groove and all exposed vertical surfaces in the joint prior to placing the sealant. Primer shall be dry at the time of placing the sealant. Contaminated primer shall be removed and replaced.

Joint Sealant: The 2-component sealant shall be mixed and placed in the groove in accordance with manufacturer's instructions. Unmixed liquid components which have been exposed to the atmosphere for more than 24 hours, shall not be used.

12-7.16 SEALANTS AND CAULKING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and applying sealants and caulking which are required for this project, but not specified elsewhere, in accordance with the details shown on the plans and these special provisions.

Related Work: Pourable polyurethane joint sealant shall conform to the requirements under "Joint Sealant" elsewhere in this Section 12-7.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of compliance shall be furnished for the sealants and caulking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUBMITTALS

Product Data: Manufacturer's descriptive data and installation instructions for all sealants shall be submitted for approval.

Samples: Color samples of all sealants shall be submitted for approval. Unless otherwise shown on the plans, colors will be selected by the Engineer from the manufacturer's standard colors.

PART 2 - PRODUCTS

MATERIALS

All sealants, primers and accessories shall be non-staining to adjacent exposed surfaces. Products having similar applications and usage shall be of the same type and same manufacturer. Gun consistency compound shall be used unless otherwise required by the job conditions.

Acrylic Sealant: Acrylic sealant shall be one compound, solvent release acrylic sealant.

Butyl Sealant: Butyl sealant shall be one component, skinning type.

Silicone Sealant: Silicone sealant shall be one component, low modulus building sealant. Sealant shall be tack-free in one hour, shall not sag or flow, shall be ozone resistant and capable of 100 percent extension without failure.

Joint Sealant: Joint sealant shall be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

Backer Rod: Backer rod shall be round, open or closed cell polyurethane. Backer rod shall be sized such that it must be compressed between 25 percent and 75 percent of its uncompressed diameter during installation in the joint.

Neoprene: Neoprene shall conform to the requirements of ASTM Designation: C 542.

PART 3 - EXECUTION

APPLICATION

Unless otherwise shown on the plans, sealants shall be applied in accordance with the manufacturer's instructions.

Silicone sealants shall not be used in locations where painting is required.

Butyl sealants shall not be used in exterior applications, and acrylic sealants shall not be used in interior applications.

Sealants shall be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant shall be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant shall remain undisturbed for not less than 48 hours.

SECTION 12-8. DOORS AND WINDOWS

12-8.01 STEEL DOORS AND FRAMES

PART 1 - GENERAL

SUMMARY

This work consists of furnishing and installing steel doors and frames.

DEFINITIONS

ANSI/SDI: American National Standards Institute/Steel Door Institute.
ANSI/NAAMM-HMMA: American National Standards Institute/National Association of Architectural Metal Manufacturers-Hollow Metal Manufacturers Association.
NRTL: Nationally Recognized Testing Laboratory as defined by OSHA in 29 CFR 1910.7.
SFM: California State Fire Marshal.

SUBMITTALS

Product Data: Submit for all products. Include the following:

1. Material descriptions
2. Core descriptions
3. Fire-resistance rating
4. Installation instructions for fire rated assemblies
5. Finishes
6. Construction details

Working Drawings: Include the following:

1. Elevations of each door design
2. Details of doors, including vertical and horizontal edge details and metal thicknesses
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses
4. Locations of reinforcement and preparations for hardware
5. Details of each different wall opening condition
6. Details of anchorages, joints, field splices, and connections
7. Details of accessories
8. Details of moldings, removable stops, and glazing
9. Where electrified door hardware is shown on the plans or specified in these special provisions, include details of conduit and preparations for power, signal, and control systems

Door Schedule: Submit a schedule of steel doors and frames using same reference numbers for details and openings shown on the plans. Include a description of the type, location and size of each door and frame. Coordinate with door hardware schedule.

QUALITY CONTROL AND ASSURANCE

Single Source Responsibility: Obtain steel doors and frames from a single manufacturer.

Steel Doors and Frames: Fabricate steel doors and frames under ANSI/SDI A 250.8 or ANSI/NAAMM-HMMA 861.

Hardware Reinforcement: Fabricate hardware reinforcement under ANSI/SDI A 250.6 with reinforcing plates from same material as door face sheets.

Fire-Rated Door Assembly Product Test Reports: Submit comprehensive tests performed by a NRTL for each type of fire-rated door assembly.

DELIVERY, STORAGE, AND HANDLING

Deliver steel doors palletized, wrapped, or crated to provide protection during transit and job site storage. Do not use nonvented plastic. Furnish additional protection to prevent damage to finish.

Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

Store steel doors and frames under cover at the job site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on at least 4-inch high wood blocking. Do not store in a way that traps excess humidity.

Furnish at least 1/4-inch space between each stacked door to allow air circulation.

COORDINATION

Coordinate installation of anchorages for steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors.

PART 2 - PRODUCTS

Thickness dimensions must be minimum thickness of base metal without coatings.

Steel sheet must comply with the following:

1. Cold rolled must be commercial steel, Type B, ASTM A 1008/A 1008M
2. Hot-rolled must be commercial steel, Type B, ASTM A 1011/A 1011M; free of scale, pitting, surface defects, and pickled and oiled
3. Metallic coated must be commercial steel, Type B, ASTM A 1008/A 1008M with at least A60 metallic coating complying with ASTM A 653/A 653M
4. Stainless steel must be Type 304, ASTM A 666

Frame anchors must be commercial steel, hot dip galvanized complying with ASTM A 153/A 153M.

Inserts and fasteners must be commercial steel, hot dip galvanized complying with ASTM A 153/A 153M.

Glazing must comply with "Glazing," of these special provisions. Glazing must be at least 3/16-inch thick and tempered.

STEEL DOORS

Steel doors must be at least 1-3/4 inches thick, full flush, seamless hollow metal construction unless otherwise shown on the plans. Construct doors with smooth surfaces without visible joints or seams on exposed faces, and the following:

1. Concealed stiffeners and hardware reinforcement from steel sheet, except use stainless steel to match stainless steel face sheets.
2. Furnish beveled edge, 1/8-inch in 2 inches, for single doors. Furnish round vertical edge with 2 1/8-inch radius for double doors.
3. Astragals must be full height, 1/8-inch flat bar or folded sheet strip, at least 0.053 inches thick, and same material as face sheets. Weld on the outside of the active leaf of double doors.

Fire-Rated Door Assemblies: Furnish assemblies complying with NFPA 80, with all components listed and labeled by a NRTL, for fire-protection ratings shown on the plans. Assemblies must be listed by the SFM.

Smoke-Control Door Assemblies: Furnish assemblies complying with UL 1784, with all components listed and labeled by a NRTL. Assemblies must be listed by the SFM. Install assemblies under NFPA 105.

EXTERIOR DOORS

Exterior doors must comply with ANSI/SDI A 250.4, physical endurance Level A, and the following:

1. Fabricate face sheets, vertical stiffeners, and top and bottom channels from at least 0.053-inch thick metallic-coated steel sheet.
2. Fabricate the steel-stiffened core using vertical stiffeners that extend full-door height. Install stiffeners not more than 6 inches apart and spot weld to both face sheets no more than 5 inches on center. Fill spaces between stiffeners with glass-fiber insulation or mineral-fiber insulation.
3. Top and bottom channels must be continuous and spot welded to both face sheets. The top channel must be flush and the bottom channel must be inverted.
4. Include moisture vents in the bottom channel.

INTERIOR DOORS

Interior doors must comply with ANSI/SDI A 250.4, physical endurance Level B, and the following:

1. Fabricate face sheets, vertical stiffeners, and top and bottom channels from at least 0.042-inch thick steel sheet unless metallic-coated sheet is shown on the plans or specified in these special provisions.
2. Use the manufacturer's standard kraft-paper honeycomb core, polystyrene core, polyurethane core, or steel-stiffened core with glass-fiber or mineral-fiber insulation.
3. Top and bottom channels must be at least 0.042 inch thick, same material as face sheets, and spot welded to both face sheets. The top channel must be flush and the bottom channel must be inverted.

STEEL FRAMES

Steel frames must comply with details shown on the plans for type and profile. Frames must be mitered corners, integral stop, and continuously welded unless otherwise shown on the plans.

Frames for fire rated doors must be listed and labeled for the same rating shown on the plans for the matching door.

Steel frames must be constructed as follows:

1. Interior frames from cold-rolled steel sheet unless metallic-coated sheet is shown on the plans or specified in these special provisions for door.
2. Exterior frames from metallic-coated steel sheet.
3. Borrowed-light frames from 0.053-inch-thick steel sheet.
4. Sidelight and transom frames from same thickness material as adjacent door frame.
5. Frames for openings 48 inches and less from 0.053-inch thick steel sheet.
6. Frames for openings wider than 48 inches from 0.067-inch thick steel sheet. Include at least 0.093-inch thick steel channel or angle stiffener head reinforcement.

FRAME ANCHORS

Jamb Anchors: Select one of the following methods to suit the wall type shown on the plans:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, at least 0.042 inch thick, with corrugated or perforated straps at least 2 inches wide by 10 inches long. For grouted frames or where shown on the plans use wire anchors at least 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud, welded to back of frames; at least 0.042-inch thick.
3. Drywall Slip-on Type: Adjustable compression anchors.
4. Post Installed Expansion Type for Tilt Up and In-Place Concrete: At least 3/8-inch diameter bolts with expansion shields or inserts. Furnish pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

Floor Anchors: Furnish the same material as frame and at least 0.042-inch thick. Select one of the following attachment methods for the floor shown on the plans:

1. Monolithic Concrete Slab: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slab: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

STOPS AND MOLDINGS

Moldings for Glazed Lites in Doors: At least 0.032-inch thick, fabricate from same material as door face sheet in which installed.

Fixed Frame Moldings: Form integral with steel frames, at least 5/8 inch high unless otherwise shown on the plans.

Loose Stops for Glazed Lites in Frames: At least 0.032-inch thick, fabricate from same material as door face sheet in which installed.

LOUVERS

Louvers for interior doors must be non-vision inverted Y type. Frame must be cold rolled steel sheet at least 0.042 inches thick, mitered corners, with hidden welds. Frame screws must be on the inside.

Louvers for exterior doors must be dual security grille type. Fabricate frame and blades from metallic coated steel sheet. Fabricate grates from metallic coated steel sheet at least 0.093 inches thick. Blades must be non-vision inverted Y type. Include removable bronze mesh insect screen mounted on the inside.

Louvers in fire-rated assemblies must be factory fabricated, multi-blade adjustable fire damper type. Frame must be cold rolled steel sheet at least 0.053 inches thick, mitered corners, with hidden welds. Include a 160 °F fusible link and removable bronze mesh insect screen mounted on the inside of exterior doors. Frame screws must be on the inside.

ACCESSORIES

Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

Ceiling Struts: At least 1/4-inch thick by 1-inch wide steel.

Grout Guards: Form from same material as frames and at least 0.016-inch thick.

Sealants: Sealants must be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multi-component, complying with ASTM C 920.

Grout: Furnish grout complying with ASTM C 476, except with a maximum slump of 4 inches, as measured under ASTM C 143.

FABRICATION

Fabricate steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at job site, clearly identify work that cannot be permanently factory assembled before shipment.

Fabricate steel doors and frames to tolerances under SDI 117 or ANSI/NAAMM-HMMA 861.

STEEL DOORS

Furnish overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where shown on the plans. Extend at least 3/4 inch beyond edge of door on which astragal is mounted.

Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold or hot-rolled steel sheet.

Factory cut glazing and louver openings in doors.

STEEL FRAMES

Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

Jamb Anchors: Unless otherwise shown on the plans, furnish number and spacing of anchors as follows:

1. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

    1.1. Two anchors per jamb up to 60 inches high.
    1.2. Three anchors per jamb from 60 to 90 inches high.
    1.3. Four anchors per jamb from 90 to 120 inches high.

2. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

    2.1. Three anchors per jamb up to 60 inches high.
    2.2. Three anchors per jamb up to 60 inches high.
    2.3. Five anchors per jamb from 90 to 96 inches high.
    2.4. Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

Compression Type Anchor: Not less than two anchors in each jamb.

Post-Installed Expansion Type Anchor: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

STOPS AND MOLDINGS

Furnish stops and moldings around glazed lites as follows:

1. Form corners of stops and moldings with butted or mitered hairline joints.
2. Furnish fixed stops and moldings welded on the secure side of steel doors and frames for single glazed lites.
3. Furnish fixed and removable stops and moldings for multiple glazed lites so that each glazed lite can be removed independently.
4. Furnish fixed frame moldings on the outside of exterior and on the secure side of interior doors and frames.
5. Furnish loose stops and moldings on the inside of steel doors and frames.
6. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation shown on the plans or specified in these special provisions.

SHOP FINISHES

Apply shop primer to steel doors, frames, and louvers. Use manufacturer's standard, fast-curing, lead-free and chromate-free primer complying with ANSI/SDI A 250.10 acceptance criteria. Primer must be recommended by manufacturer for substrate; and compatible with field-applied coating.

PART 3 - EXECUTION

Examine rough-in for embedded and built-in anchors to verify actual locations before frame installation. Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

Check door frames for square, alignment, twist, and plumb before installation and adjust if necessary. Tolerances are ±1/16 inch.

Check the door frame as follows:

1. Squareness at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment at jambs on a horizontal line parallel to plane of wall.
3. Twist at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness at jambs on a perpendicular line from head to floor.

Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

Doors, frames, stops, molding, louvers, and accessories must be cleaned, prepared, and painted under "Painting," of these special provisions before installation.

If grout contains an antifreezing agent, field apply a bituminous coating to the backside of frames.

INSTALLATION

Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with manufacturer's written instructions. Install fire rated assemblies under NFPA 80, the SFM, and the manufacturer's written instructions.

After installation, measure frames for squareness, alignment, twist, and plumbness under "Preparation." Adjust to meet tolerances when required.

Remove grout and other bonding material from exposed surfaces of steel doors and frames immediately after installation.

Install and fit fire rated assemblies under NFPA 80.

Install and fit smoke-control door assemblies under NFPA 105.

STEEL FRAMES

Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove spreaders and braces. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

Where frames are fabricated in sections because of shipping or handling limitations, field splice at accepted locations by welding face joint continuously. Grind, fill, dress, and make splices smooth, flush, and invisible on exposed faces.

Install frames with removable glazing stops located on the secure side of opening.

Install floor anchors for each jamb and mullion that extends to the floor and secure with expansion anchors.

Coordinate installation of frames to allow for solidly filling space between frame and walls with grout or mineral-fiber insulation as shown on the plans.

Solidly pack mineral-fiber insulation behind frames set in metal-stud partitions. Fill frames in masonry or concrete walls with grout. Hand trowel grout; do not pump in. Do not allow frames to be deformed or damaged by grout forces.

STEEL DOORS

Fit steel doors accurately in frames. Shim as necessary. Clearances must be as follows:

1. Jambs and Head: 1/8 inch ±1/16 inch.
2. Between Edges of Pairs of Doors: 1/8 inch ±1/16 inch.
3. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
4. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

GLAZING

Install glazing under "Glazing," of these special provisions and the door manufacturer's written instructions. Secure stops with countersunk machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

ADJUSTMENTS

Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Replace defective work, including steel doors and frames that are warped, bowed, or otherwise unacceptable.

FIELD FINISH REPAIRS

After installation, clean field welds, bolted connections, and abraded areas of paint under SSPC-SP 2. Apply one coat of the same coating as applied for painting to the cleaned areas. Use galvanizing repair paint for metallic coated surfaces complying with manufacturer's written instructions.

12-8.02 ROLL-UP STEEL DOORS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing roll-up steel doors in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data:

Manufacturer's descriptive data, roughing-in diagram and installation instructions for each size and type of door shall be submitted for approval.

Manufacturer's descriptive data shall include door curtain construction and material thickness, door track size and material thickness, counterbalance spring service life and motor operator specifications.

Materials list shall contain all items proposed to be furnished and installed under this section of these special provisions.

Working drawings shall show details of special components and installations which are not fully dimensioned or detailed in manufacturer’s descriptive data.

QUALITY ASSURANCE

Single Source: Each sectional door shall be provided as a complete unit produced by one manufacturer, including frames, sections, bracket guides, tracks, counterbalance mechanisms, hardware, operators and installation accessories, to suit opening and head room available.

Wind Loading: Design and reinforce section overhead doors to withstand a 26 pounds per square foot wind load with a midspan deflection not to exceed 1/120 span.

PART 2 - PRODUCTS

MANUFACTURERS

Available Manufacturers: Subject to compliance with the specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to the following: Cookson Company; Cornell Iron Works; McKeon Rolling Door Company, Inc.; Overhead Door Corp.; Raynor; or equal.

MATERIALS

DOOR SECTIONS

Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance size and type of door indicated, and as follows:

1. Style of Slats: Curved-profile design as selected from manufacturer's standards.
2. Insulation: Slats shall be filled with manufacturer's standard rigid cellular polystyrene or polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Insulation shall be filled completely within metal slat faces.
3. Metal interior Curtain -Slat Facing: Match metal of exterior certain- slat face.

Steel Door Curtain Slats At Steel Coiling Doors: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.036 inch (20 gage) and as required to meet design requirements.

Stainless-Steel Door Curtain Slats At Stainless Steel Coiling Doors: ASTM A 666, Type 304; sheet thickness of 0.036 (20 gage) inch and as required to meet design requirements.

Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from metal to match curtain slats and finish.

Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

HOOD

General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

Galvanized Steel: Nominal 0.028-inch thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.

Stainless Steel: 0.025-inch thick stainless-steel sheet, Type 304, complying with ASTM A 666.

Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

LOCKING DEVICES

Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

Lock Cylinders: Provide cylinders standard with manufacturer and keyed to building keying system.

Keys: Provide minimum three keys for each cylinder, unless otherwise indicated.

CURTAIN ACCESSORIES

Smoke Seals: Equip each fire-rated door with smoke-seal perimeter gaskets for smoke and draft control as required for door listing and labeling by a qualified testing agency.

Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.

At door head, use 1/8-inch thick, replaceable, continuous sheet secured to inside of hood.

At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch thick seals of flexible vinyl, rubber, or neoprene.

Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

Provide pull-down straps or pole hooks for doors more than 84 inches high.

Automatic-Closing Device for Fire-Rated Doors: Equip each fire-rated door with an automatic-closing device that is inoperative during normal door operations and that has a governor unit complying with NFPA 80 and an easily tested and reset release mechanism designed to be activated by the following:

Building fire-detection and -alarm systems and manufacturer's standard door-holder-release devices.

COUNTERBALANCING MECHANISM

General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

ELECTRIC DOOR OPERATORS

General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

Comply with NFPA 70.

Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.

Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

Door Operator Location(s): Operator location indicated for each door.

Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements unless otherwise indicated.

Electrical Characteristics:

Phase: Single phase.
Volts: 208 V.
Hertz: 60.

Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.

Speed in first subparagraph below is for standard-speed doors. Consult manufacturer and revise for higher-speed operation.

Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 40 feet per minute and not more than 60 feet per minute, without exceeding nameplate ratings or service factor.

Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. For fire-rated doors, activation delays closing.

Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

Sensor Edge: Automatic safety sensor edge, located within astragal or weatherstripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 30 lbf.

Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

METAL FINISHES

Factory Prime Finish on Steel: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

Surface Preparation of Stainless Steel: Remove tool and die marks and stretch lines, or blend into finish.

Polished Stainless Steel Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.

Run grain of directional finishes with long dimension of each piece.

When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

Directional Satin Finish: No. 4.

PART 3 - EXECUTION

INSTALLATION

Install roll-up steel doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

Install roll-up steel doors, hoods, and operators at the mounting locations indicated for each door.

Accessibility: Install roll-up steel doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

12-8.03 ACCESS DOORS

PART 1 – GENERAL

Scope: This work shall consist of furnishing and installing access doors in accordance with the details shown on the plans and these special provisions

SUBMITTALS

Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Access Doors: Access doors shall be factory assembled and factory prime painted steel. Door panel shall be 0.075 inch thick (14-gage) and door frame shall be 0.060 inch thick (16-gage). The door and frame assembly shall have standard screw driver operated cam locks, concealed springs or continuous piano hinge and inside release handle. Access doors shall be by Babcock-Davis Hatchways, Bar-Co Access Doors, Inryco-Milcor, J.L. Industries, or equal.

PART 3 - EXECUTION

INSTALLATION

Access doors shall be installed in accordance with the manufacturer's recommendations.

The access door assemblies shall be painted to the match the color of the adjacent surrounding surfaces

12-8.04 RAPID ROLL-UP DOORS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing rapid roll-up doors in accordance with the details shown on the plans and these special provisions.

Rapid roll-up doors shall open vertically and shall be electric motor operated of the size and type shown on the plans, with guides, header hoods, door curtains, hardware, fastenings, mechanisms, controls, and all accessories, required for the complete installation and safe operation of the door.

Related Work: Conduit and wiring shall be in accordance with the requirements specified in Section 12-16, "Electrical," of these special provisions.

SYSTEM DESCRIPTION

Design Requirements:

Rapid roll-up doors shall be designed to withstand a wind pressure of 20 pounds per square foot of door area and have a near-airtight seal and knock-away feature for easy reassemby upon impact.

Door curtain shall have a temperature service range of -40º F to 180º F.

SUBMITTALS

Product Data: Submit manufacturer's descriptive data and installation instructions.

Working Drawings: Working drawings showing door types, sizes, locations, metal gages, hardware provisions, installation details, and other details of construction shall be submitted for approval. Motor-operated doors shall include wiring diagrams for motors and controls, supporting brackets for motors, location, type, and ratings of motors and safety devices.

CONTRACT CLOSEOUT SUBMITTALS

Operation and Maintenance Manuals:

Operation and maintenance instructions with parts lists, and manufacturer's warranties and guarantees shall be submitted.

Prior to the completion of the contract, submit 3 identified copies of the operation and maintenance instructions with parts lists for the door assembly, including motor operator, shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

DELIVERY, STORAGE AND HANDLING

Doors and accessories shall be protected from damage during delivery, storage and handling. Manufacturer’s brand name shall be clearly visible.

Doors shall be stored in a dry location with adequate ventilation, free from dust and water, and in such a manner as to permit access for inspection and handling. Damaged items which cannot be restored to like-new condition shall be removed and replaced.

WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door that do not comply with requirements or that fail in materials, finish, or workmanship for a period of 5 years from the date of Project Completion.

PART 2 - PRODUCTS

RAPID ROLL-UP DOOR SYSTEM

Rapid Roll-up Doors: Doors shall be motor operated, vertically opening, overhead coiling type, and shall be designed for high-cycle use on exterior openings as shown on the plans. Doors shall be springless type, operated by electric power with auxiliary hand chain operation. Doors shall be complete with guides, hardware, fastenings, operating mechanisms and accessories. Doors shall be surface mounted type with guides at jambs set back a sufficient distance from the interior side of the jambs to provide a clear opening width from jamb to jamb and a clear opening height when the door is in the fully open position.

Upon activation, the door curtain shall rapidly ascend and coil around a shaft mechanism located in a hood assembly above the door head. Shaft shall be sized to carry the door load with a deflection of not more than 0.03 inches per foot of opening width. Door system shall be equipped with a braking mechanism actuated by a thru-beam-type photocell detector that will stop the decent of the door if an object is located in the path of the door and reverse the direction of the door.

COMPONENTS

Door Curtain: Composite assembly, constructed of steel, aluminum and ethylene propylene diene monomer (EDPM) with molded curtain locks located along the vertical edges of the curtain capable of holding the curtain in the door guides under windload conditions. Curtain color: gray.

Jamb Guides: One piece extruded aluminum designed to resist a 20 psf windload over the surface of the curtain, forming a continuous slot of sufficient depth to retain the door curtain and allow it to move freely in the guides. Provide jamb guide steel mounting angles or brackets to securely fasten guides to door jambs.

Bottom Rail: Formed from two steel angles bolted together with a knock-away section centered in the bottom rail to reduce risk of damage during accidental impacts and provide ease of straightening and easy reassembly. Bottom rail shall extend the full width of the curtain and be equipped with a sensing edge to stop and reverse the door if door is obstructed by an object in its path. Sensing edge shall be replaceable without removing the bottom rail from the curtain.

Electrical Operation: 3.2 horsepower, 460 volt, 3 phase motor and sprocketing capable of opening door at speeds of 20 inches per second and close door at 12 inches per second. Door operator designed for high-cycle operations, equipped with rotary screw-type limit switches to control open and close positions with an electro-mechanical brake system to stop and hold door in any position. Operator equipped with built-in manual emergency chain hoist with an electrical interlock to prevent motor operation during use of manual chain hoist. Chain hoist capable of operating door at a pull force of 20 to 30 pounds. Operator controlled by a programmable logic controller (PLC) located in a NEMA 4 enclosure, including an adjustable closing timer, three push buttons for open, close, and stop functions and a cycle counter. Stop button shall stop door and hold door open at any location.

Red/Green Door Light: Each door shall be equipped with a red/green door light. When door is closed or opening, red light shall be activated. When door is fully opened, green light shall activate. See plans for location of red/green light.

Weatherstripping: replaceable, capable of providing a weathertight seal at door head, jambs, and sill. Type as recommended by the rapid roll-up door manufacturer.

PART 3 - EXECUTION

PREPARATION

Openings shall be prepared to the correct dimensions to receive the rapid roll-up doors. Headers shall be level and jambs shall be plumb. Headers and jambs shall not have projections. Overhead tracks or similar assemblies shall not obstruct openings.

Tracks and supports shall be secured, reinforced, laterally braced and supported as necessary to prevent swaying and vibration of the doors.

INSTALLATION

Doors and accessories shall be installed in accordance with the door manufacturer's instructions and the approved shop drawings, and shall provide an installation which will operate freely without binding.

Anchors and inserts for guides, brackets, motors, switches, controllers and other accessories shall be accurately located and installed as shown in the manufacturer's instructions and the approved shop drawings.

Any material or equipment not mentioned herein or shown on the plans which may be necessary for the completion of the installation and the proper operation of the rapid roll-up doors shall be furnished and installed.

FIELD QUALITY CONTROL

Manufacturer's Field Service: The Contractor shall arrange to have an authorized representative of the rapid roll-up door manufacturer present, at the time the doors are installed, to assist in the door installation. After doors are installed, doors shall be tested for proper operation and adjustments made so doors operate smoothly, consistently and properly.

12-8.05 ALUMINUM CURTAIN WALL SYSTEM

PART 1 - GENERAL

SUMMARY

This work shall consist of furnishing and installing aluminum curtain wall system, consisting of aluminum framing, fixed windows and insulated metal panels, where shown on the plans, complete with all hardware and accessories necessary for a complete weathertight unit, in accordance with the details shown on the plans and specified in these special provisions.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of Compliance shall be furnished for all aluminum curtain wall systems in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUBMITTALS

Complete working drawings showing elevations of curtain wall; details of each frame type; typical and special details of construction; location installation requirements for hardware; size, shape, and thickness of materials; finishes; fastenings and method of anchoring; size and spacing of anchors; details of operating hardware method and materials for weatherstripping; and details of installation.

Deflection of curtain wall system shall be limited to L/175 when subjected to 15 psf of wind pressure. Curtain wall system shall comply with CBC and the American National Standard A58-1-1972 for applicable wind load test pressure. Wind load calculations shall be provided and shall recognize sloped glazed condition. Calculations shall be signed by a California Licensed Engineer.

Seismic and wind loads: See design loads in structural drawings.

Finish samples shall be submitted. Each sample shall be a representative section of each specified panel with the specified color finish applied to that section. Sections shall be a minimum of 8 inches long, complete with stops and glazing beads, metal panel fasteners and anchors for all substrates on the job.

Operation and Maintenance Data: Provide operation and maintenance manual containing printed instructions for operation, adjustment, care, and maintenance of the door and accessories. Manuals shall be consistent with manufacturer's standard brochures, printed instructions, general operating and troubleshooting procedures, and safety precautions.

DELIVERY, STORAGE, AND HANDLING

Windows, insulated metal panels, and accessories shall be delivered in original, unopened, unbroken containers, wrappings, or bags with labels bearing the brand name, name of manufacturer or supplier, standard of manufacture, and product description.

Windows, insulated metal panels, and accessories shall be stored off the ground, kept dry, fully protected from weather and damage

Exposed surfaces shall be free from defects, scratches, streaks, or other surface blemishes.

WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

Warranty Period: 5 years from date of Project Completion.

Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

Warranty Period: 5 years from date of Substantial Completion.

PART 2.- PRODUCTS

MATERIALS

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: Vistawall Architectural Products, CMI Architectural, Kawneer Company, or equal.

Aluminum:

Alloy and temper shall be as recommended by manufacturer for type of use and finish to meet the performance requirements specified herein.

Extruded Bars, Rods, Profiles, and Tubes: Shall conform to ASTM B 221M.

Structural Profiles: Shall conform to ASTM B 308/B 308M.

Welding Rods and Bare Electrodes: Shall conform to AWS A5.10/A5.10M.

Aluminum Sheet: Shall conform to ASTM B 209M.

Aluminum Frame: Aluminum frame shall be made from extruded bars, rods, shapes, and tubes.

Aluminum Door:

Aluminum Door: Aluminum door shall be glazed door with medium stiles of not less than 1/8-inch nominal wall thickness, thermally treated and artificially aged 6061 or 6063 extruded aluminum alloy tubing reinforced to receive hardware.

Aluminum Finishes: Polyvinylidene fluoride (PVDF) conforming to AAMA 2605 "Superior Performing Organic Coatings on Aluminum Extrusions and Panels." Acceptable Finish Systems: Duranar XL , Hylar 5000, or equal.

Bullet resistant frames: Bullet resistant frames shall be made from bullet resistive steel in accordance with the ballistics requirements to resist super power small arms. Frames shall have all edges closed tightly together with full welded mitered joints and with all welds dresses smooth and flush. Frames shall have steel, applied

glazing stops, fastened to the interior side of the frame. All metal surfaces shall be cleaned and factory primed with interior side of frame. All metal surfaces shall be cleaned and factory primed with one coat of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Aluminum Sunshade: Aluminum Sunshade shall be attached directly to the curtain wall intermediate horizontal members utilizing extruded components and aluminum panels. Panels shall be made from .090 aluminum sheets. All extrusions and panels shall match aluminum frame finish.

Glazing:

Glazing shall be in accordance with the requirements specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions.

Finish on all exposed areas of aluminum windows and components shall match aluminum frame finish.

Insulated Metal Panels:

Acceptable manufacturers shall be Laminators Inc., Mapes Industries Inc., or equal.

Insulated metal panels shall be factory-formed and assembled wall panels fabricated from two metal facing sheets, two honeycomb or corrugated stabilizers, and an insulation core that is foamed-in-place during fabrication.

Facing Sheets: Facing sheets shall be fabricated panels with exterior and interior facings sheets of same material and thickness. Material shall be aluminum sheet, 20-guage.

Honeycomb or Corrugated Stabilizer: Shall be installed in between exterior and interior facing sheets for increased impact resistance and shall be of appropriate thickness for a 2-inch thick panel.

Insulated Core Material: Extruded or expanded polystyrene board insulation shall conform to Extruded or Molded-Polystyrene Board Insulation: ASTM C 578

Screws, Fasteners, and Window Accessories: Screws, fasteners, and window accessories shall be of non-corrosive metals that are compatible with aluminum. Finish for other metal hardware shall match window finish.

Weatherstripping: Weatherstripping shall be continuous, replaceable type, wool pile mounted in metal, or double runs of ultraviolet resistant neoprene or vinyl.

Sealant: Sealant shall be single-component, solvent type acrylic, self-leveling, non-sag, conforming to Federal Specification: TT-S-230.

Tape: Tape shall be compatible with sealant and shall be Pecora, "B-44 Extra-Seal;" Pittsburg Plate Glass, "Duribbon;" Protective Treatment, "PTU 606;" Tremco, "440 Tape;" or equal.

FINISHES

Finishes shall comply with recommendations relative to applying and designating finishes contained in NAAMM's "Metal Finishes Manual for Architectural and Metal Products." Finish shall be Duranar or Hylar 5000 of minimum 70% PVDF comply with requirements of AAMA 2605.

Surfaces shall be cleaned and given conversion coating pre-treatment prior to application of .3 mil dry film thickness of epoxy or acrylic primer following recommendations of finish coat manufacturer.

Provide 3 coat system as required for color selected.

PART 3.- EXECUTION

FABRICATION

Frame and sash shall be accurately machined and fitted to hairline joinery that develops the members. Joints shall be factory sealed weathertight.

INSTALLATION

Curtain wall shall be set straight, level, plumb and true alignment on frames in accordance with the installation instructions. Clearance between the unit and the building framing shall be as shown on the plans.

Erection tolerances shall be as follows:

Plumb: 1/8 inch in 12 feet, 1/4 inch in 50 feet.

Alignment: Where surfaces abut in a line, offset shall be from true alignment to 1/16 inch; where a reveal or protruding element separates aligned surfaces by less than 2 inches, offsets shall be limited to 1/2 inch.

Location: Limit variation from plan or location shown on working drawings shall be 1/8 inch in 12 feet; 1/2 inch over total length.

The installation shall be flashed and sealed weathertight.

Isolation coating shall be provided to separate adjoining, incompatible materials.

Both inside and outside surfaces of metal shall be cleaned of all mortar, plaster, paint, and other foreign matter. Surfaces that are stained, discolored, or that cannot be satisfactorily cleaned and repaired shall be replaced with new materials at no additional cost to the State.

FIELD QUALITY CONTROL

Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.

Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

Water Spray Test: Before installation of interior finishes has begun, areas designated by Engineer shall be tested according to AAMA 501.2 and shall not evidence water penetration.

Test Area: A minimum area of 75 feet by 1 story of aluminum-framed systems.

Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports.

12-8.06 STOREFRONT ENTRANCES

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing interior and exterior entrance doors and storefront framing in accordance with the details shown on the plans and these special provisions.

Related Work: Glazing shall be as specified in under "Glazing" in Section 12-8 "Doors and Windows," of these special provisions.

PERFORMANCE REQUIREMENTS

General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.

Dimensional tolerances of building frame and other adjacent construction.

Failure includes the following:

1. Deflection exceeding specified limits.
2. Thermal stresses transferring to building structure.
3. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
4. Noise or vibration created by wind and by thermal and structural movements.
5. Loosening or weakening of fasteners, attachments, and other components.
6. Failure of operating units.

Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional Civil or Structural Engineer, using performance requirements and design criteria indicated.

Wind Loads: 20 psf.

Seismic and wind loads: See design loads in structural drawings.

Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: 10 seconds.
3. ASTM E 283 requires using a static-air-pressure difference of 1.57 lbf/sq. ft. unless otherwise indicated, which is equivalent to a 25-mph wind. Static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa) is equivalent to a 50-mph (80-km/h) wind.

Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

SUBMITTALS

Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for storefront system components including frame, hardware, trim, windows, and accessories. Provide product test reports.

Working Drawings: Provide detailed drawings of the aluminum-framed system including installation details, door, hardware and anchor locations, and accessories.

Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a Civil or Structural Engineer registered in the state of California.

Samples for Initial Selection: Manufacturer's color samples consisting of aluminum material showing the full range of colors, textures, and patterns available.

Finish samples shall be submitted. Each sample shall be a representative section of each specified panel with the specified color finish applied to that section. Sections shall be a minimum of 8 inches long, complete with stops and glazing beads, meatl panel fasteners and anchors for all substrates on the job.

Operation and Maintenance Data: Provide operation and maintenance manual containing printed instructions for operation, adjustment, care, and maintenance of the door and accessories. Manuals shall be consistent with manufacturer's standard brochures, printed instructions, general operating and troubleshooting procedures, and safety precautions.

Warranties: Sample of special warranties.

QUALITY ASSURANCE

Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

Product Options: Information on the drawings and in the Special Provisions establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

Preinstallation Conference: Conduct conference at Project site unless otherwise required.

WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

Warranty Period: 5 years from date of Project Completion.

Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

Warranty Period: 5 years from date of Substantial Completion.

PART 2 – PRODUCTS

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: Vistawall Architectural Products, CMI Architectural, Kawneer Company, or equal.

MATERIALS

Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

Sheet and Plate: ASTM B 209.
Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
Extruded Structural Pipe and Tubes: ASTM B 429.
Structural Profiles: ASTM B 308/B 308M.
Welding Rods and Bare Electrodes: AWS A5.10.

Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

Structural Shapes, Plates, and Bars: ASTM A 36.
Cold-Rolled Sheet and Strip: ASTM A 1008.
Hot-Rolled Sheet and Strip: ASTM A 1011.

FRAMING SYSTEMS

Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

Construction: Thermally broken.
Glazing System: Retained mechanically with gaskets on four sides.
Glazing Plane: As indicated.

Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
Reinforce members as required to receive fastener threads.

Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123 or ASTM A 153.

Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

GLAZING SYSTEMS

Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

ENTRANCE DOOR SYSTEMS

Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

Thermal Construction**:** High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

Coordinate entrance door design in first subparagraph below with hardware requirements. Narrow-stile doors may not accommodate some exit devices.

Door Design: As indicated.

Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

Entrance Door Hardware: As specified under "Finish Hardware" in Section 12-8 "Doors and Windows" of these special provisions.

Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

FABRICATION

Form or extrude aluminum shapes before finishing.

Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

Profiles that are sharp, straight, and free of defects or deformations.
Accurately fitted joints with ends coped or mitered.
Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
Physical and thermal isolation of glazing from framing members.
Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
Provisions for field replacement of glazing from interior.
Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

Entrance Doors: Reinforce doors as required for installing entrance door hardware.

Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

After fabrication, clearly mark components to identify their locations in Project according to Working Drawings.

FINISHES

Finishes shall comply with recommendations relative to applying and designating finishes contained in NAAMM's "Metal Finishes Manual for Architectural and Metal Products." Finish shall be Duranar or Hylar 5000 PVDF comply with requirements of AAMA 2605.

Surfaces shall be cleaned and given conversion coating pre-treatment prior to application of .3 mil dry film thickness of epoxy or acrylic primer following recommendations of finish coat manufacturer.

Finish coat of 70% minimum fluorocarbon resin fused to primed surfaces at temperature recommended by manufacturer, 1.0 mil minimum dry film thickness.

Provide 3 coat system as required for color selected.

MISCELLANEOUS ITEMS

Anchors: Anchors shall be manufacturer's standard.

Glazing: Glazing shall conform to the requirements specified under "Glazing," in Section 12-8.08 of these special provisions.

Backer Rod: Backer rod shall be close cell, non-absorbent, non-staining foam rod compatible with sealant.

Sealant: Sealant shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, single component. Sealant shall conform to Federal Specification: TT-S-227.

PART 3 – EXECUTION

INSTALLATION

Comply with manufacturer's written instructions.

Do not install damaged components.

Fit joints to produce hairline joints free of burrs and distortion.

Rigidly secure non-movement joints.

Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

Seal joints watertight unless otherwise indicated.

Metal Protection:

Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

Set continuous sill members and flashing in full sealant bed to produce weathertight installation.

Install components plumb and true in alignment with established lines and grades, and without warp or rack.

Install glazing as specified under "Glazing" in Section 12-8 "Doors and Windows," of these special provisions.

Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

Exterior Doors: Install to produce weathertight enclosure and tight fit at weatherstripping.

Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

FIELD QUALITY CONTROL

Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.

Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

Water Spray Test: Before installation of interior finishes has begun, areas designated by Engineer shall be tested according to AAMA 501.2 and shall not evidence water penetration.

Test Area: A minimum area of 75 feet by 1 story of aluminum-framed systems.

Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports.

12-8.07 TRANSLUCENT PANEL WINDOWS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing insulated translucent fiberglass panel windows in accordance with the details shown on the plans and these special provisions.

Translucent panel windows shall include double-faced flat sandwich panels, aluminum frames, glazing accessories, fasteners, and frame anchors and such other components, not listed, but required for a rigid, secure, weatherproof, and complete installation.

PERFORMANCE REQUIREMENTS

Deflection of entire system shall be no more than L/45, unless otherwise indicated.

Structural Loads: The translucent panel windows shall be capable of withstanding wind and seismic loads specified in the 2007 CBC.

Air/Water Infiltration: For water penetration, translucent panel windows shall be tested per procedures of ASTM-331, and shall show no water entry at WTP=10.00 psf, at 5.00gph/ft. squared. Test shall be performed before and after uniform loads are applied. For air leakage, system shall be tested per procedures of ASTM E-283, and shall show results on no more than 0.01 cfm/ft. squared at 1.56 psf (25 mph) and 0.01 cfm/ft. squared at 6.24psf (50 mph).

SUBMITTALS

Manufacturer's product data: Include construction details material descriptions, profiles and finishes of components.

Working drawings: Include elevations, details, dimensions and attachments to other work shall be submitted for approval. Working drawings shall show the anchorage and means of frame isolation from dissimilar materials.

Design Calculations: Provide for the fastening system of the insulated translucent panel windows to other work shall be submitted to verify compliance with CBC requirements.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown. The engineer's signature shall be original.

Product test reports: Provide from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project. Test reports required are:

Flame Spread and Smoke Developed (ASTM E-84 by UL 723)
Burn Extent (ASTM D-635)
Color Difference (ASTM D-2244)
Impact Strength (UL 972)
Tensile Bond Strength (ASTM C-297 after aging by ASTM D-1037)
Shear Bond Strength (ASTM E-72)
Insulation "U" Factor (by NFRC 100, ASTM C-236, E-1423 and C-1199)
NFRC Certification - Optional
Condensation Resistance Factor (AAMA 1503)
Class A Roof Covering Burning Brand (ASTM E-108)
Class A Roof System UL listed (UL-790) - Optional
Class I Fire Approval (FM 4881) - Optional.

Proof of regular, independent quality control monitoring under a nationally recognized building code review and listing program shall be submitted.

Samples: Submit product samples showing thickness, face sheets, colors and insulation 14 inch x 28-inch and factory-finish aluminum in 5" long sections.

Manufacturer's color chart: Show the full range of colors available for factory-finished aluminum.

QUALITY ASSURANCE

Certificate of Compliance: Certificate of compliance shall be furnished for translucent window panels in accordance with the requirements specified in Section 6-1.07, "Certificate of Compliance," of the Standard Specifications.

Manufacturer: System manufacturer must be listed by a recognized building code authority, including the international Conference of Building Officials, which requires quality control inspections, and fire, structural and water infiltration testing by an approved agency.

Performance Requirement: The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

Field Measurements: Verify dimensions in system installation areas and indicate if dimensions on shop drawings are actual guaranteed dimensions.

PART 2 - PRODUCTS

MATERIALS

Translucent window panels shall be manufactured from glass fiber reinforced thermoset resins by insulated system fabricator specially for architectural use. Thermoplastic (e.g., polycarbonate, acrylic) faces are not acceptable.

Flammability

The interior face sheet shall be UL listed and have a flame spread rating no greater than 50 (20) and smoke developed no greater than 250 (200) when tested in accordance with UL 723. Burn extent by ASTM D-635 shall be no greater than 1". Faces shall not deform, deflected or drip when subjected to fire or flame, or become detached when subjected to 300 degree for 25 minutes.

Weatherability:

The exterior face shall have a permanent glass veil erosion barrier integrally embedded to provide maximum long-term resistance to fiber exposure. Sacrificial plastic surface films, coatings or veils not acceptable.

Exterior face sheet shall be smooth, .70" thick and White in color. Interior face sheet shall be .45" thick and White in color. Faces shall not vary more than +/- 10% in thickness and be uniform in color.

Panel system shall be 2-3/4" thick, made of two (2) sheets of translucent fiberglass, bonded by heat and pressure to either an aluminum or composite grid core specifically for architectural use.

Thermal Insulation: Panels shall have a NFRC laboratory tested "U" factor of .23 or .29, thermally broken by ASTM C-236, E-1423 and C-1199. System shall be NFRC certified.

Light and Solar Transmission: Panels shall have a light transmission of 15 per ASTM E 972.

Grid Core:

Grid pattern shall be nominal 12" x 24" shoji and symmetrical about the horizontal centerline for each flat panel.

The thermally broken (aluminum) I-beam grid core shall be 6063-T6 or 6005-T5 with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16". The I-beam grid shall be machined to tolerance of not greater than +/- .002". Thermal break shall be 1" wide minimum.

Panels shall withstand 1200 degree F fire for minimum (1) hour without collapse or exterior flaming.

Thermally broken panels shall give minimum CRF (Condensation Resistance Factor) of 80 by AAMA 1503 measured on the grid line.

Adhesive:

The laminate adhesive shall be heat and pressive resin-type engineered for structural sandwich panel use, with minimum 25 years field use, Adhesive shall pass testing requirements specified by the International Conference of Building Officials "Acceptance Criteria for Sandwich Panel Adhesive."

Minimum strength shall be 750 PSI tensile strength by ASTM C-297 after two (2) exposures to six (6) cycles each of the aging conditions prescribed by ASTM D-1037.

Shear strength by ASTM D-1002 minimum after exposures to five (5) separate aging conditions:

50% Relative Humidity at 73 degree F: 540 PSI

182 degree F: 100 PSI

Accelerated Aging by ASTM D-1037 at room temperature: 800 PSI

Accelerated Aging by ASTM D-1037 at 182 degree F: 250 PSI

500 Hour Oxygen Bomb by ASTM D-572: 1400 PSI

Impact Resistance:

The exterior face sheet shall be uniform in strength, impenetrable by hand-held pencil and impact equal to 70 (230) ft. lbs. Without fracture or tear when impacted by a 3-1/4" diameter. Free-falling per UL 972.

Translucent structural sandwich panel shall be a true sandwich panel of flat fiberglass sheets bonded to a grid core of mechanically interlocking I-beams and shall be laminated under a controlled process of heat and pressure, and deflect no more than 1.9" at 30 psf in 10' by ASTM E-72.

The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge. In order to insure bonding strength, white spots at intersections of muntins and mullions shall not exceed 4 for each 40 sq. ft. of panel, nor shall they be more than 3/36" in width.

Panels and aluminum perimeter frame shall be pre-assembled where practical and sealed at the factory. Panels should be shipped to the job site in rugged shipping units, ready for erection.

Perimeter Closure System, Batterns, and Aluminum Finishes:

Closure system shall be extruded 6063-T6 and 6063-T5 aluminum clamp-tite screw type. Curved closure system may be roll formed. (Thermal break system optional for walls.)

Aluminum closures to be supplied with 300 series stainless screws (excluding final fasteners to building) and shall be factory sealed to the panels. Aluminum battens and cap plates shall be field installed.

All exposed aluminum to be (mill) (architectural corrosion resistant finish which meet the performance requirements of AAMA 2604, color to be selected from manufacturer's standards).

Flexible sealing tape shall be manufacturer's standard pre-applied to serrated edges of closure system at factory under controlled conditions.

Closure system: Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

Finish: Exposed aluminum to be manufacturer's factory applied finish that meets the performance requirements of AAMA 2604. (Mill).

PART 3 - EXECUTION

EXAMINATION

Do not install systems until conditions adversely affecting installation and performance have been corrected.

PREPARATION

The general contractor shall prepare openings including isolation dissimilar materials from aluminum system which may cause damage by electrolysis, and shall provide temporary enclosures if required.

Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

INSTALLATION

The installer shall erect translucent panel system in strict accordance with approved working drawings as supplied by manufacturer, including fastening and sealing. All surfaces shall be cleaned before sealants are applied.

Secure non-moveable joints and accommodate thermal and mechanical movements.

Insure weep holes are correctly installed.

Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

Install joint sealant at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

After other trades have completed work on adjacent material, inspect translucent panel installation and make any adjustment necessary to ensure proper installation and weather-tight conditions.

All staging and lifts required for the complete panel system installation and field measuring shall be provided by and maintained by the general contractor.

CLEANING

Clean panel system, both sides, after installation according to manufacturer's recommendations.

12-8.08 WINDOWS

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing windows in accordance with the details shown on the plans and these special provisions.

Windows shall be commercial (C) grade aluminum prime windows unless otherwise shown on the plans.

Windows shall meet the requirement of NAFS-1, "Voluntary Performance Specification for Windows, Skylights, and Glass Doors," and shall meet the C30 (Commercial) product designation unless otherwise shown on the plans. Windows shall be labeled with the AAMA label.

Finish for windows shall be Architectural Class I, clear anodized finish meeting American Architectural Manufacturer's Association Standard 611 unless otherwise shown on the plans.

Glazing for windows shall be in accordance with the requirements specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions.

Certificates of Compliance: Certificates of compliance shall be furnished for all windows in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUMITTALS

Manufacturer's descriptive data, installation instructions and schedule shall be submitted for approval.

Manufacturer's descriptive data and installation instructions shall show window elevations, plan views, full size sections, anchoring details to all substrates, anchors and hardware.

Installation schedule shall show location, size and type for each window.

PART 2 - PRODUCTS

Door and Transom Windows: Door and transom windows shall be door or door frame manufacturer's standard window framing, glazing stops and glazing accessories.

Fixed Windows: Fixed windows shall be non-operable glazed panel inserted into a frame to include muntins, glazing stops, and glazing accessories.

Horizontal sliding Windows: Horizontal sliding windows shall be horizontal slide by windows with tightly contacting weatherstripped meeting stiles, self-lubricating rollers, glazing accessories, tubular sill, snap locks and push handle. Vents shall be screened.

Aluminum: Aluminum shall be extruded 6063-T5 aluminum alloy.

Screws, Fasteners and Window Accessories: Screws, fasteners and window accessories shall be non-corrosive metals compatible with aluminum except guides and rollers may be vinyl and nylon respectively. Finish for locks, operators, strikes, keepers and other metal hardware shall match window finish.

Weatherstripping: Weatherstripping shall be continuous, replaceable type, wool pile mounted in metal or double runs of ultraviolet resistant neoprene or vinyl.

Vent Screen: Vent screen shall be aluminum frame with 18 x 14 mesh aluminum screening and polyvinyl-chloride splines. Screen frames shall be removable from interior of building. Finish of screen frame shall match window finish.

Sealant: Sealant shall be single-component, solvent type acrylic, self-leveling, non-sag, conforming to Federal Specification: TT-S-230.

Tape: Tape shall be compatible with sealant; Pecora, "B-44 Extra-Seal;" Pittsburg Plate Glass, "Duribbon;" Protective Treatment, "PTU 606;" Tremco, "440 Tape;" or equal.

Accessories:

Transaction Drawer: Transaction drawer unit shall be a security drawer cabinet when open to the public or private side. Prevents entry of outside air or weather and maintain a bullet resistant protection level of level 3. The drawer in the closed position shall allow a protected visual inspection of the drawer before lid of the drawer is opened into the interior. The stainless steel front of the cabinet shall pivot upward as the drawer slides outward on stainless steel full extension ball bearing drawer slides. The exterior of the cabinet and the drawer unit construction shall be of stainless steel and polycarbonate plastic construction. The inside drawer dimensions shall be approximately 14" width, 7" height and 15" depth.

Speak through: Speak Through device shall be made of stainless steel concentric circular louvers spaced to deflect projectiles entering the cavity between the interior and exterior surfaces without interfering with conversation. The device shall have a bullet resistant protection level of Level 3. The device shall be approximately 6" diameter and be able to accommodate 1 3/16" thick glazing. Exposed visible finish shall be polished Number 7 finish.

PART 3 - EXECUTION

FABRICATION

Frame and sash shall be accurately machined and fitted to hairline joinery that develops the members. Joints shall be factory sealed weathertight.

Outward opening vents without roto-type operators shall be provided with adjustable sliding friction type hold-open assemblies.

Sash shall be removable from the interior only. Sash shall have concealed condensation weeps to the outside.

DELIVERY AND STORAGE

Windows shall be delivered in original, unopened, unbroken containers, wrappings, or bags with labels bearing the brand name, name of manufacturer or supplier, standard of manufacture, and product description.

Windows and accessories shall be stored off the ground, kept dry, fully protected from weather and damage

INTALLATION

Window units shall be set straight, level, plumb and in true alignment in prepared openings. Windows shall be centered in openings. Clearance between the window unit and the building framing shall be from 3/16 inch to ¼ inch at the sides and ½ inch at the top. Ventilator sash shall be adjusted after glazing for easy, smooth and proper operation.

The installation shall be flashed and sealed weathertight.

All aluminum surfaces in contact with masonry, steel or other incompatible materials shall be isolated with pressure sensitive tape, zinc chromate primer, bituminous paint or such other material recommended by the window manufacturer and approved by the Engineer.

12-8.09 DOOR HARDWARE

PART 1 - GENERAL

SUMMARY

Scope: This work consists of furnishing and installing mechanical door hardware and electrified door hardware for swinging doors.

Design Requirements

Hardware must be free of defects, blemishes, and excessive play. Obtain each kind of hardware from 1 manufacturer for (1) latch and locksets, (2) exit devices, or (3) hinges and closers.

Furnish hardware items required to complete the work complying with performance level and design intent. Comply with the manufacturers' instructions for installation.

Furnish the manufacturer's updated item where specified item is now obsolete.

Furnish hardware with suitable fasteners to complete work.

Furnish ANSI/BHMA A156 Operational Grade 1 and Security Grade 1 door hardware unless otherwise specified.

Fire-Rated Door Assemblies: Furnish door hardware (1) rated for use, (2) listed by the SFM, and (3) complying with NFPA 80.

Smoke-Control Assemblies: Furnish door hardware (1) rated for use, (2) listed by the SFM, (3) complying with UL 1784, and (4) installed under NFPA 105.

Maintenance Tools: Furnish a complete set of specialized tools for continued adjustment, maintenance, removal, and replacement of door hardware.

DEFINITIONS

BHMA: Builders Hardware Manufacturers Association.
NRP: Non-removable pin.
NRTL: Nationally Recognized Testing Laboratory as defined by OSHA in 29 CFR 1910.7.
SFIC: Small format interchangeable core.
SFM: California State Fire Marshal.

SUBMITTALS

Product Data: Submit for all products. Include the following:

1. Manufacturer's technical information and catalog cuts for each door hardware item. Include style, function or type, grades, size, and finish.
2. Fasteners and other pertinent information.
3. Explanation of abbreviations, symbols, and codes contained in schedules.
4. ANSI/BHMA certification.
5. SFM listing and UL approval where specified in these special provisions.
6. Installation details for door hardware.
7. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

Working Drawings:

Submit locations of door hardware sets, cross-referenced to drawings, both on floor plans and in door schedule. Include identification number, location, hand, fire rating, and material of each door and frame.

Submit details of electrified door hardware, including:

1. Power, signal, and control wiring diagrams. Include conductor numbers.
2. Schematic diagrams of interface of electrified door hardware and building intrusion and security systems.

Door Hardware Schedule: Submit door hardware sets with all items required for each door. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, style, thickness, hand, function, and finish of door hardware.

Closeout Documents:

Include closeout documents in the *Maintenance and Operations Manual* before completion of the work. Submit 1 copy of PDF files on CD or DVD.

Closeout documents must include the following:

1. Index.
2. Parts list.
3. Operating instructions.
4. Maintenance instructions.

Incomplete or inadequate documentation will be returned for correction and resubmittal.

QUALITY CONTROL AND ASSURANCE

Floor Stops must comply with California Access Compliance Reference Manual Policy No. 99-08, *Door Stops and Other Floor-Mounted Obstructions*.

Regulatory Requirements

Door hardware and installation must comply with the CBC and the following table:

Door hardware item	ANSI/BHMA Standard
Full mortise hinges	ANSI/BHMA A156.1
Cylindrical locksets	ANSI/BHMA A156.2
Automatic flush bolts, panic devices, exit only devices, and coordinators	ANSI/BHMA A156.3
Door closers	ANSI/BHMA A156.4
Lock cylinders, single cylinder deadbolts and electric strikes	ANSI/BHMA A156.5
Push plates, pull plates, kick plates, and mop plates	ANSI/BHMA A156.6
Mortise locksets	ANSI/BHMA A156.13
Manual flush bolts, floor stops, wall stops, door stops, and wall bumpers	ANSI/BHMA A156.16
Materials and finishes	ANSI/BHMA A156.18
Thresholds	ANSI/BHMA A156.21
Door gasketing, automatic door bottoms, door shoes with rain drip, door sweeps, door top weatherstrips, and overhead door drips	ANSI/BHMA A156.22
Electromechanical locks	ANSI/BHMA A156.23
Keying systems	ANSI/BHMA A156.28
Electric strikes and frame mounted actuators	ANSI/BHMA A156.31
Hardware preparation in steel doors and steel frames	ANSI/BHMA A156.115
Hardware preparation in wood doors with wood or steel frames	ANSI/BHMA A156.115W

Certificates

Product Certificates: From manufacturer; that electrified door hardware is approved for use on types and sizes of labeled fire-rated doors and complies with listed fire-rated door assemblies.

PART 2 - PRODUCTS

GENERAL

General: Door hardware equal in material, grade, type, size, function, design, quality and manufacture to that specified herein shall be submitted for approval.

Butt Hinges:

Butt hinges shall be steel, 1 1/2-pair per door .leaf up to 7’-0” high an additional hinge for each 2'-0" above 7'-0" highs. Nonremovable pins shall be provided at outswing exterior doors. Hinge size shall be

4½" x 4½" for up to 3'-0" wide doors and 5" x 4-1/2" for over 3'-0" wide doors. Plain bearing hinge shall be used at doors without closers.

Standard weight hinges shall be:

Manufacturer	steel	Stainless steel
Hager	BB 1279	CB1191
McKinney	TB 2714	TA 2314
Stanley	BB 179	FBB 191
or equal.		

Heavy weight hinges shall be:

Manufacturer	steel	Stainless steel
Hager	BB 1279	BB1191
McKinney	T4A 3786	TA4 3586
Stanley	BB 179	FBB 199
or equal.		

Power Transfer Hinge: Hinge with electric through wire, 4 wire power transfer with rating of 3.5 Amp continuous and 16 Amp pulse.

Mortise Exit Devices:

Heavy duty mortise type panic devices shall be installed at single doors and on the active leaf of pairs of doors, unless indicated otherwise. A concealed top and bottom vertical rod device shall be provided for the inactive leaf of pairs of doors. Device shall have outside key operation with lever and escutheon plate. Device shall have cylinder dogging feature except at UL rated door openings.

Dorma	9000
Monarch	18
Von Duprin	99

Electric Mortise Lockset:

Electric mortise lockset shall be a lever operated heavy operated heavy duty lockset with electric latch retraction and request to exit function. Outside lever is unlocked by external electric power. Latchbolt is retracted by card reader outside or lever inside. Lockset shall conform to ANSI A156.13. All levers shall return to within 1/2" of door face. Door and frame preparation for the mortise lockset shall conform to ANSI115.1.

Shalage	L9080EL-RX
Best	45HW-15
SDC	Z7850-EE

Electric Exit Device:

Electric Exit Device shall be heavy-duty rim type with electric latch retraction and request to exit function. Device shall be installed at single doors and on the active leaf of pairs of doors. A concealed top and bottom vertical rod device shall be provided for the inactive leaf of pairs of doors. Pair of doors shall have removable mullion.

Dorma	9300 ES
Monarch	ELR 18R
Von Duprin	99 EL

Mortise Locksets, Electrical locksets Latchsets and Privacy Sets:

Mortise locksets, latchsets and privacy sets shall be steel case with 1¼" x 8" face plate and 2¾-inch backset, and shall be extra heavy duty and conform to ANSI A156.13. Door and frame preparation for mortise locksets, latchset and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	40H 6FW 15M
Falcon	LM521 DN
Schlage	L9453R x 06
or equal.	

Lever operated privacy set:

Best	35H 0L 15H
Falcon	LM311 DG
Schlage	L9040 x 06
or equal.	

Cylindrical Locksets, Latchsets and Privacy Sets:

Cylindrical locksets, latchsets and privacy sets shall be steel chassis, 2 1/8-inch diameter, 2¾-inch backset. Door and frame preparation for cylindrical lockset, latchsets and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	93K6 AB 9C
Schlage	D53RD RHO
Falcon	LY501 DG
or equal	

Exterior lever operated lockset shall have anti-vandal lever.

Lever operated latchset shall be:

Best	93K ON 9C
Falcon	LY101 D
Schlage	D10S RHO
or equal.	

Cylindrical Dead Locks:

Cylindrical dead locks shall have one-inch throw bolt with concealed hardened steel inserts and one-inch diameter bolt housing, 2¾-inch backset.

Single cylinder dead lock with inside thumb turn shall be:

Best	83T 7K
Falcon	D441
Schlage	B460R
or equal.	

Double cylinder dead lock shall be:

Best	83T 7M
Falcon	D431
Schlage	B462R
or equal.	

Flush Bolts:

Flush bolts shall be installed at the top and bottom of the inactive leaf of pairs of doors. Provide automatic bolts on UL rated pairs of doors.

Flush bolts for manual operation shall be:

Trimco	3915
Glynn Johnson	FB6
H.B. Ives	457
or equal.	

Flush bolts for automatic operation shall be:

Door Control	840
Glynn Johnson	FB7
H.B. Ives	559
or equal.	

Panic Devices:

Rim type panic devices shall be installed at single doors and on the active leaf of pairs of doors, unless indicated otherwise. A vertical rod device shall be provided for the inactive leaf of pairs of doors. Dogging devices shall be omitted at UL rated door openings. Panic devices shall be concealed rod with automatic flush bolts.

Panic devices with outside key operation shall be:

Dorma	9500 08
Monarch	18-M-L
Von Duprin	9875L

Surface Door Closers:

Surface Door Closers: ANSI/BHMA 156.4, Grade 1. Heavy-duty arms and knuckles. Full rack and pinion type with removable non-ferrous cover, 1 1/2 inch minimum bore. Place closers inside building, stairs, and rooms. Provide appropriate closer type so that closers are not visible to public view.

The sweep period of the closer shall be adjusted so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

Closers shall be non-handed, non-sized, adjustable, and multi-size 1 through 6.
Drop brackets are required at narrow head rails.
Doors closers only on right hand pull leaf of double doors.
Separate adjusting valves for closing and latching speed, and backcheck.

Coordinators:

Coordinators shall be used in conjunction with pairs of doors and shall hold the active door open until the trigger mechanism is released by the closing inactive door. The device shall have excessive pressure override and be compatible with flush bolts. Filler bar trim will be placed where coordinator does not

cover door stop. The device shall conform to ANSI A156.3. Finish shall be US26D satin chromium plated.

IVES	COR series
Rockwood	1600
DCI	600

Door Pulls:

Door pulls shall be 1 1/4" diameter base, 3' projection, 2 1/2" clearance

Push/Pull Set:

Push/Pull Set shall be 1" round bar stock, 2 1/2" projection, 1" diameter base, and 10" pull. Fastening shall be fully concealed type.

Pushplates and Pullplates:

Pushplates and pullplates shall be 4" x 16" x 16-gage. Grips shall be one-inch diameter with 1½-inch standoff and 8-inch center to center fastening, unless indicated otherwise.

Pushplates shall be:

Builders Brass	47-E
Quality	40-5
Trimco	1001-3
or equal.	

Pullplates shall be:

Builders Brass	1618-E
Quality	1515
Trimco	1013-3B
or equal.	

Door Protection Plates: BHMA A156.6.

Sizes of Armor Mop and Kickplates:

2 inch less than door width for single doors; one inch less than door width for pairs of doors. Provide 10 inch kick plates for flush doors and one inch less than height of bottom rail for panel doors. Provide a minimum 36 inch armor plates for flush doors and completely cover lower panels of panel doors, except 16 inch high armor plates on fire doors. Provide 6 inch mop plates.

Kickplates

Kickplates shall be 10 inches in height x 2 inches less than door width x 16-gage.

Kickplates shall be:

Builders Brass	37X
Quality	48
Trimco	K0050
or equal.	

Mop plates shall be stainless steel, 16-gage, 6 inches in height by 2 inches less than the door width.

Mop plates shall be:

Trimco	
Ives	
or equal	

Floor Mounted Stops:

Floor mounted stops shall be dome type. The height of the stop shall be determined by the clearance required when a threshold is used or not used.

Stops for openings without thresholds shall be:Builders Brass	8061
Quality	331
Trimco	1210
or equal.	

Stops for openings with thresholds shall be:

Builders Brass	8063
Quality	431
Trimco	1213
or equal.	

Wall or Door Mounted Door Stop:

Wall or door mounted door stop shall have a 3¾-inch projection and 3-point anchoring.

Wall or door mounted door stop shall be:

Builders Brass	W96
Quality	38
Trimco	1236-1/4-2
or equal.	

Wall Mounted Door Stop and Holder:

Wall mounted door stop and holder shall be:

Builders Brass	W141X
Quality	36/136
Trimco	1207
or equal.	

Wall Bumpers:

Wall bumpers base diameter shall be 2½ inches with a one-inch projection.

Bumpers shall be:

Builders Brass	WC9
Quality	302
Trimco	1270CV
or equal.	

Automatic Door Bottom:

Automatic door bottom shall be heavy duty, full mortise for hollow metal doors.

Bottom shall be:

Pemko	A20PKL
Zero	355A
or equal.	

Thresholds, Rain Drips, Door Sweeps and Door Shoes:

Thresholds, Rain Drips, Door Sweeps And Door Shoes: shall conform to the sizes and configurations shown on plans. Thresholds at door openings with accessibility-requirements shall not exceed ½ inch in height. As scheduled and per details. Comply with CBC Section 1133B.2.4.1.

Manufacturer: Threshold, rain drip, door sweep and door shoe manufacturers shall be Pemko, Reese, Zero, or equal.

Threshold Bedding Sealant: Threshold bedding sealant shall conform to Federal Specification: SS-C-153.

Weatherstrip and Draft Stop:

Weatherstrip and draft stop shall conform to the sizes and shapes shown on plans. Assemblies shall be UL listed and shall be provided where shown on the plans or as specified in these special provisions

Door Seals And Weatherstripping:

Doors and frames shall be fitted with door seals or gaskets where indicated, and exterior doors and frames shall be fitted with applied rain drips and weatherstripping on all four sides (entire perimeter of opening) in accordance with applicable requirements of SDI 111.

Weatherstripping and seals shall be non-ferrous, with synthetic rubber edge seals where indicated or required, of type or style appropriate for the purpose. Drips and visible weatherstripping shall be painted out to match doors and frames.

Door seals or gasketing for fire-rated doors and acoustical doors shall be synthetic rubber of type manufactured and appropriate for the purpose.

Acceptable manufacturers shall be Pemko, Reese, Zero, or equal.

Brush Weatherstrip:

Brush weatherstrip shall consist of densely compressed UV stabilized nylon filaments encased in mill finish aluminum retainer with stainless steel sheet metal fastening screws. A continuous rain drip shall be integrated with the aluminum retainer.

Door Signs and Name Plates: Door signs and name plates shall be as specified under "Signs" in Section 12-10, "Specialties," of the special provisions.

Electric Door Strike: Electric door strike shall be Von Duprin 6000 Series, Folger Adams Co. 732-75 Series or equal.

Electromagnetic Door Locks: Electromagnetic door locks shall be electromagnetic locking device capable of at least 1800 pound force and suitable for outdoor use. Electromagnetic lock shall be Securiton Magnalock Series; Schilage Magforce Series, or equal.

Shop Fabrication

Manufacturer's Nameplate: Do not use products that have manufacturer's name or trade name displayed in a visible location except with required fire-rated labeling. Manufacturer's identification will be permitted on lock cylinder rims.

Base Metals: Furnish door hardware items of base metal specified, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware items. Do not use a manufacturer's standard materials or forming methods if different from the specified standard.

Fasteners: Screws must comply with commercially recognized industry standards for application intended. Furnish Phillips oval-head screws finished to match surface of door hardware. Furnish fire-rated fasteners for labeled assemblies for the following:

1. Surface hinges to steel doors.
2. Closers to steel doors and frames.
3. Surface-mounted exit devices to steel doors and frames.
4. Spacers or sex bolts for through bolting of hollow-metal doors.

Finishes

Interior Hardware: Standard Finish 626 (US 26D), satin chromium.

Exterior Hardware: Standard Stainless Steel Finish 630 (US 32D), satin stainless steel. Where shown on the plans, use Standard Finish 626 (US 26D), satin chromium.

Factory Covering: Apply a strippable, temporary protective covering to exposed finishes before shipping.

PART 3 - EXECUTION

Doors and Frames: Doors and frames must be set square, plumb, and properly prepared before hardware installation.

EXAMINATION

Doors and Frames: Examine doors and frames for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting door hardware installation.

Electrified Door Hardware: Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

INSTALLATION

Furnish heavy weight hinges for (1) interior doors with closers or panic devices, (2) interior doors wider than 3'-5", and (3) exterior doors. You must use 4-1/2 inch hinges unless otherwise shown on the plans or specified in these special provisions.

Furnish standard weight hinges for interior doors unless otherwise specified. For doors 2'-0" wide you must use 3 inch hinges. For doors wider than 2'-0" you must use 3-1/2 inch hinges.

Hardware items must be accurately fit, securely applied, adjusted, and lubricated to comply with the manufacturer's instructions. Hardware items must operate without binding or excessive play.

Hinges must be installed at equal spacing with the end hinges not more than 9-5/8 inches from the top and bottom of the door. Kickplates and mop plates must be mounted on the push side of the doors, 1 inch up from bottom edge.

Thresholds must be set in a continuous bed of bedding sealant.

Mechanical stops on concrete surfaces must be attached with expansion anchoring devices. Mechanical stops mounted elsewhere must be attached with wood screws. Do not locate stops in the path of travel.

Hardware, except hinges, must be removed from surfaces to be painted before painting. Do not install surface-mounted items until finishes have been completed on substrates involved.

Furnish all dogging keys, closer valve keys, lock spanner wrenches, other factory furnished installation aids, instructions, and maintenance guides to the Engineer.

Install continuous weatherstripping at each edge of exterior door leaf. Seal finish must match adjacent frame color.

LOCK CYLINDERS

Install temporary cores in all lockable doors during construction.

Furnish permanent cores and keys to the Engineer before Contract acceptance. The Department will install the permanent cores.

CLEANING AND PROTECTION

Clean adjacent surfaces soiled by door hardware installation.

Clean hardware items as necessary to restore proper function and finish.

Furnish final protection and maintain conditions that ensure that door hardware is without damage or deterioration before Contract acceptance.

ADJUSTING

Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of HVAC equipment.

Electric Strike: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

DOOR HARDWARE SCHEDULE

Furnish hardware sets as specified in the following tables:

GROUP 1

1 each	top, intermediate, and bottom offset pivots by door manufacturer
1 each	mortise lock panic device with electric strike.
1 each	door pull
1 each	door closer with hold-open arm
1 each	floor mounted doorstop
1 each	aluminum threshold
1 each	brush weatherstrip with rain drip.
1 each	integral weatherstripping
1 each	kickplate

GROUP 2

1 each top and bottom offset pivots by door manufacturer
1 each intermediate power transfer offset pivot by door manufacturer
1 each electric exit device, request to exit function
1 each door pull
1 each power supply
1 each card reader, outside
1 each door closer with hold-open arm
1 each floor mounted doorstop
1 each Aluminum threshold
1 each brush weatherstrip with rain drip
1 each integral weatherstripping
1 each kickplate

GROUP 3

1 each top and bottom offset pivots by door manufacturer
1 each intermediate power transfer offset pivot by door manufacturer
1 each electric mortise lockset, request to exit function
1 each power supply
1 each card reader, outside
1 each door closer with hold-open arm
1 each floor mounted doorstop
1 each Aluminum threshold
1 each brush weatherstrip with rain drip
1 each integral weatherstripping
1 each kickplate

GROUP 5

2 each top, and bottom offset pivots by door manufacturer
1 each intermediate power transfer offset pivot on active leaf by door manufacturer
1 each intermediate offset pivot on inactive leaf by door manufacturer
1 each card reader, outside
1 each electric mortise lockset, request to exit function on active leaf
1 each power supply
1 each concealed top and bottom rods at inactive leaf
2 each door closer with hold-open arm with dead stop
1 each coordinator
1 each aluminum threshold
2 each brush weatherstrip with rain drip
2 each integral weatherstripping
2 each kickplate

GROUP 6

1 each top, intermediate, and bottom offset pivots by door manufacturer
1 each mortise lockset, entrance function
1 each door closer with hold-open arm
1 each kickplate
1 each wall mounted doorstop

GROUP 7

1 each top, intermediate, and bottom offset pivots by door manufacturer
1 each push/pull set
1 each door closer with hold-open arm
1 each kickplate
1 each wall or floor mounted doorstop

GROUP 8

Butt hinges, with one power transfer hinge
1 each electric mortise lockset, request to exit function
1 each power supply
1 each card reader
1 each door closer
1 each wall mounted doorstop
1 each kickplate

GROUP 9

Butt hinges
1 each mortise latchset
1 each door closer
1 each wall mounted doorstop
1 each kickplate

GROUP 10

Butt hinges
1 each cylinder lockset, corridor function
1 each door closer with hold-open arm
1 each wall mounted doorstop
1 each kickplate

GROUP 11

Butt hinges
2 each door pull
1 each door closer with hold-open arm
1 each wall mounted doorstop
1 each kickplate

GROUP 12

Butt hinges
1 each mortise lockset, privacy with 'Occupied' indicator function
1 each door closer with hold open and dead stop
1 each kickplate

GROUP 13

Butt hinges
1 each cylindrical lockset, corridor function
1 each double dummy trim lever on inactive door
1 each concealed top and bottom flush bolts on inactive door
2 each door closer with hold-open arm and dead stop
1 each coordinator
2 each kickplate

GROUP 14

Butt hinges
1 each cylindrical lockset, storeroom function
1 each double dummy trim lever on inactive door
1 each concealed top and bottom flush bolts on inactive door

GROUP 15

Hinge as per gate manufacturer with one self closing hinge
1 each mortise lockset with anti-vandal lever, entrance function
1 each pair of heavy duty stainless steel padlock eyes

GROUP 16

Butt hinges
1 each cylindrical latchset
1 each door closer with hold open
1 each aluminum threshold
1 each door shoe with rain drip
1 each integral weatherstripping

GROUP 18

Butt hinges
1 each cylindrical lockset, storeroom function
1 each cylindrical dead lock
1 each door closer with dead stop
1 each aluminum threshold
1 each brush weatherstrip
1 each integral weatherstripping
1 each kickplate

GROUP 19

Butt hinges
1 each cylindrical lockset, storeroom function
1 each double dummy trim lever on inactive door
1 each cylindrical dead lock
1 each concealed top and bottom flush bolts on inactive door
2 each door closer with dead stop
1 each coordinator
1 each aluminum threshold
1 each brush weatherstrip with rain drip
1 each integral weatherstripping

GROUP 21

Butt hinges, with one power transfer hinge
1 each electric mortise lockset, request to exit function
1 each power supply
1 each card reader, outside
1 each door closer with dead stop
1 each aluminum threshold
1 each brush weatherstrip
1 each integral weatherstripping
1 each overhead rain drip
1 each kickplate

GROUP 22

1 each top, intermediate, and bottom offset pivots by door manufacturer
1 each panic exit device
1 each door closer with hold-open arm
1 each kickplate
1 each Wall or floor mounted doorstop

GROUP 23

1 each top and bottom offset pivots by door manufacturer
1 each intermediate power transfer offset pivot by door manufacturer
1 each mortise lock panic exit device
1 each door pull
1 each power supply
1 each card reader, outside
1 each door closer with hold-open arm
1 each floor mounted doorstop
1 each Aluminum threshold
1 each brush weatherstrip with rain drip
1 each integral weatherstripping
1 each kickplate

GROUP 24

Hinge as per gate manufacturer with one self closing hinge
1 each mortise lock panic device with anti-vandal lever, entrance function
1 each pair of heavy duty stainless steel padlock eyes

12-8.10 GLAZING

PART 1 - GENERAL

SUMMARY

This work consists of furnishing and installing glazing.

Glazing for windows, doors, and other glazed openings includes:

1. Glass
2. Polycarbonate cores and laminated sheets

DEFINITIONS

SHGC: Solar Heat Gain Coefficient.
Surface: Surfaces of lites numbered inward with the exterior surface being the 1st surface.

SUBMITTALS

GENERAL

Submit manufacturer's product data including catalog cuts, performance data, installation instructions, and additional documentation.

Submit glass samples for each type of glass product, 12-inch square.

Submit glazing accessory samples for gaskets, sealants and colored spacers, in 12-inch length. Install sealant samples between two strips of material representative in color of adjoining framing system.

Submit delegated-design for glass indicated to comply with performance requirements and design criteria, including wind load calculations and analysis data shall be sealed by a California structural engineer.

Submit samples of special warranties.

Submit the installation schedule. The installation schedule must include the location, size, and type for each glazing.

Adhesion and Compatibility Testing Reports:

Submit adhesion and compatibility testing reports. Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants. Testing will not be required if data is submitted based on previous testing of current sealant products and glazing materials matching those submitted.

For materials that fail tests, submit manufacturer's instructions for corrective measures, including use of specially formulated primers.

QUALITY CONTROL AND ASSURANCE

Each individual pane of heat strengthened or tempered glass must bear an identification label complying with ASTM C 1048.

Each individual pane of bullet-resistant glass must bear an identification label of performance complying with UL 752 or ASTM F 1233.

Safety glass must be permanently labeled under 24 CA Code of Regs Pt 2 § 2406.

PART 2 - PRODUCTS

GENERAL

Glass must be clear glass, unless otherwise shown on the plans, and comply with ASTM C 1036 and the following:

1. Tempered glass must comply with ASTM C 1048.
2. Heat strengthened glass must comply with ASTM C 1048.
3. Laminated glass must comply with ASTM C 1172.

Furnish glass thicknesses specified unless otherwise shown on the plans.

Advantages of acrylic compared to polycarbonate: more resistant to UV, yellowing, abrasion, and chemicals.

Glazing

Float Glass:

Float glass must be Type I, Class 1 or Class 2, Quality-Q3 glass.

Float glass thickness must be:

1. 1/8-inch thick for panes less than 10 square feet
2. 3/16-inch thick for panes between 10 and 28 square feet
3. 1/4-inch thick for panes over 28 square feet

Patterned Glass: Patterned glass must be Type II, Class 1, Form 3, Quality-Q5, Finish-F1 glass and either Pattern P1 or P2. Patterned glass must be 1/8-inch thick.

Tempered Glass: Tempered glass must be Kind-FT, Condition-A, Type 1, Class 1, and Quality-Q3 glass.

Heat Strengthened Glass: Heat strengthened glass must be Kind-HS, Condition A, Type 1, Class 1, and Quality-Q3 glass.

Laminated Glass: Conform ASTM C1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. 1/4" minimum thickness fabricated from two pieces of Type I, Class I, Quality q3 or better glass fused to plastic interlayers.

Wire Glass: Conform ASTM 1036T, Type II, Class I, Form I, Quality -q6 complying with ANSI Z97.1, Class C, Mesh M1; 1/4" thick clear polished wire glass with diamond mesh.

Low-e Coated Glass: Low-e coated glass must be clear float glass with a clear coating complying with ASTM C 1376.

Insulating Glass Assemblies:

Insulating glass assemblies must be low -e coated insulating glass.

Insulating glass assemblies must be factory assembled sealed lites of glass separated by a dehydrated interspace with desiccant, spacer with dual seals, and qualified under ASTM E 2190.

The outdoor lite must be clear float glass. The indoor lite must be clear float glass. The glass assembly must have:

1. Maximum nighttime U-factor of 0.28
2. Maximum daytime U-factor of 0.26
3. Maximum SHGC of 0.27
4. Minimum visible light transmittance of 0.64
5. Maximum shading coefficient of 0.32

Security–Glass: Security glass must be clear, Kind GCP, Single Core, and complying with ASTM C 1349. Outer lites must be heat-strengthened glass or chemically strengthened glass with a 1/8-inch thick polycarbonate core. Polycarbonate core must be Type 1 complying with Appendix X1. Security glass interlayers must comply with Appendix X2.

Bullet Resistant Glass: Bullet Resistant Glass shall be multiple laminated glass fused to plastic interlayers: UL listed, Level 3 protection. A low emissivity coat film shall be sandwiched between two plastic interlayers in the laminated glass assembly in accordance to the manufacturer's recommendations.

Bullet resistant glass shall meet the following performance criteria:

U-value	1.00 max.
Daylight transmittance	68 %
Exterior daylight reflectance	8%
Shading coefficient	0.50%
Ultraviolet blockage	99%

Miscellaneous Materials: Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels must be top grade, commercial quality, complying with the glass or sheet manufacturer instructions and complying with GANA *Glazing Manual* and the IGMA *North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*.

PART 3 - EXECUTION

GENERAL

Safety glass must be installed under 24 CA Code of Regs Pt 2 § 2406.

INSTALLATION

Glazing must be installed under the GANA *Glazing Manual* and the IGMA *North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*.

Cut edges of tinted glass must comply with the glass manufacturer's instructions. The glazier must inspect each edge of tinted glass. Panes with edges that do not comply with the manufacturer's standards for tinted glass edges for sunny elevations will not be allowed.

Panes must be bedded fully and evenly, set straight and square within panels so that the pane is entirely free of any contact with metal edges and surfaces.

For panes on the exterior of buildings, the glazing on both sides of the panes must provide a watertight seal and watershed. Seals must extend no more than 1/16-inch beyond the holding members. A void must be left between the vertical edges of the panes and the glazing channel. Weep systems must be provided to drain condensation to the outside.

Panes in assemblies using extruded gasket glazing must be set under the assembly manufacturer's instructions using gaskets and stops supplied by the manufacturer.

Laminated glass must be set on setting blocks.

Whenever welding or burning of metal is in progress within 15 feet of glazing materials, a protective cover must be provided over exposed surfaces.

REPLACEMENT AND CLEANUP

Panes must be kept clean of cement and plaster products, cleansers, sealants, tapes and all other foreign material that may cause discoloration, etching, staining, or surface blemishes to the materials.

Excess sealant left on the surface of the glass or surrounding materials must be removed during the work life of the sealant.

Solvents and cleaning compounds must be chemically compatible with materials, coatings and glazing compounds. Cleaners must not have abrasives that scratch or mar the surfaces.

The protective covering on plastic sheet surfaces must not be removed until construction is completed or 2 weeks after glazing, whichever is shorter. The covering must be removed before adhesives dry sufficiently to adhere to the sheet during removal rather than the protective membrane.

All broken, scratched, or cracked glass must be replaced before Contract acceptance.

Paint, dirt, stains, labels, and surplus glazing compound must be removed without scratching or marring the surface of the panes or metal work, except do not remove etched labels.

SECTION 12-9. FINISHES

12-9.01 RUBBER TILE FLOORING

PART 1 – GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing resilient flooring in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data, installation instructions, color and pattern samples shall be submitted for approval. Samples of tile shall be 24" x 24" in size.

PROJECT CONDITIONS

Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F in spaces to receive floor coverings during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

Until project completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

Close spaces to traffic during floor covering installation.

Close spaces to traffic for 48 hours after floor covering installation.

Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 – PRODUCTS

Rubber flooring product of 100 percent synthetic virgin rubber (SBR), 10 year warranty, slip resistant ADA compliant, Cosmo smooth speckled type.

1. Hardness: Not less than 85 measured using Shore, Type A durometer per ASTM D 2240.
2. Wearing Surface: Smooth unless otherwise indicated.
3. Thickness: 0.125 inch.
4. Size: Roll 75" x 32.8’
5. Seaming Method: Manufacturer's Standard.
6. Abrasion Resistance: DIN 52516, 500 g load, < 160 mm^3
7. Colors and Patterns: As indicated by manufacturer's designations.

Unbacked Rubber Sheet Floor Covering: ASTM F 1859.

1. Type: 100% synthetic virgin rubber, styrene Butadiene Rubber (SBR)
2. Thickness: 1/8 inch. min.

Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D 2240.

Wearing Surface: Smooth.

Sheet Width: As standard with manufacturer width

Seaming Method: Standard.

INSTALLATION MATERIALS

Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

Adhesives: Water-resistant type recommended by manufacturer to suit flooring and substrate conditions indicated.

Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

PART 3 - EXECUTION

EXAMINATION

Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

PREPARATION

Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

Concrete Substrates: Prepare according to ASTM F 710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring."

Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

APPLICATION

Comply with manufacturer's written instructions for installing flooring.

Lay out flooring from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

Lay flooring square with room axis.

Match flooring material for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

Lay flooring with grain running in one direction.

Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

Extend flooring into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

CLEANING AND PROTECTION

Comply with manufacturer's written instructions for cleaning and protection of floor tile.

Perform the following operations immediately after completing floor tile installation:

Remove adhesive and other blemishes from exposed surfaces.

Sweep and vacuum surfaces thoroughly.

Damp-mop surfaces to remove marks and soil.

Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

12-9.02 GYPSUM WALLBOARD

PART 1 – GENERAL

Scope: This work shall consist of furnishing, installing and finishing gypsum wallboard in accordance with the details shown on the plans and these special provisions.

Where assembly fire ratings are indicated on the plans, construction shall provide the fire resistance in accordance with the applicable standards in the Fire Resistance Design Manual published by the Gypsum Association.

Wallboard backing for use in restroom and shower areas shall be water-resistant gypsum backing board.

PART 2 - PRODUCTS

Gypsum Wallboard**:** Gypsum wallboard shall conform to ASTM Designation: C 36/C 36M.

Gypsum Backing Board**:** Gypsum backing board shall conform to ASTM Designation: C 442/C 442M.

Water-resistant Gypsum Backing Board**:** Water-resistant gypsum backing board shall conform to ASTM Designation: C 630/C C 630M.

Gypsum Sheathing Board**:** Gypsum sheathing board shall conform to ASTM Designation: C 79/C 79M.

Exterior Gypsum Soffit Board**:** Exterior gypsum soffit board shall conform to ASTM Designation: C 931/C 931M.

Joint Tape and Joint and Finishing Compound**:** Joint tape and joint and finishing compound shall conform to ASTM Designation: C 475.

Corner Beads, Metal Trim and Control Joints**:** Corner beads, metal trim and control joints shall be galvanized steel of standard manufacture.

Corner Guard: Corner guard dimension shall be 3"x3", 3'-6' in length, 90 with end cap. Profile shall be high-impact vinyl acrylic extrusion with continuous 6063-T6 aluminum retainer along entire length, and comply Class 1/A fire rating, tested in accordance with ASTM E 84.

Resilient Metal Channel**:** Resilient metal channel shall be galvanized sheet steel channels of standard manufacture for reducing sound transmission in wood frame partitions.

Fasteners**:** Fasteners shall be gypsum wallboard nails conforming to ASTM Designation: C 514 or steel drill screws conforming to ASTM Designation: C 1002.

PART 3 - EXECUTION

DELIVERY AND STORAGE

Materials shall be delivered in original packages, containers or bundles bearing brand name, applicable standard of manufacture, and name of manufacturer or supplier and shall be kept dry and fully protected from weather and direct sunlight exposure. Gypsum wallboard shall be stacked flat with adequate support to prevent sagging or damage to edges, ends and surfaces.

INSTALLATION

Wallboard panels to be installed on ceilings and soffits shall be installed with the long dimension of the panels perpendicular to the framing members. Wallboard panels to be installed on walls may be installed with the long

dimension of the panels either parallel or perpendicular to the framing members. The direction of placing the panels shall be the same on any one wall or partition assembly.

Edges of wallboard panels shall be butted loosely together. All cut edges and ends shall be smoothed as needed for neat fitting joints.

All edges and ends of gypsum wallboard panels shall coincide with the framing members, except those edges and ends which are perpendicular to the framing members. End joints on ceiling and on the opposite sides of a partition assembly shall be staggered.

Except where closer spacings are shown on the plans, the spacing of fasteners shall not exceed the following:

Nails	7 inches
Screws	12 inches
Screws at perimeter of panels for fire resistive assemblies having metal framing	8 inches

Type S steel drill screws shall be used to fasten wallboard to metal framing. Nails or Type W steel drill screws shall be used to fasten wallboard to wood framing. Except as shown on the plans, screws shall not be used in fire resistive assemblies.

Adhesives shall not be used for securing wallboard to framing.

Gypsum wallboard panels shown on the plans for shear wall sheathing or for fire resistive assemblies shall be fastened to all framing members. Gypsum wallboard panels at other locations and gypsum wallboard finish over plywood sheathed shear walls shall be fastened to all framing members except at the following locations:

At internal angles formed by ceiling and walls; ceiling panels shall be installed first with the fasteners terminating at a row 7 inches from the walls, except for walls parallel to ceiling framing. Wall panels shall butt the ceiling panels. The top row of wall panel fasteners shall terminate 8 inches from the ceiling.

At internal vertical angles formed by the walls; fasteners shall not be installed along the edge or end of the panel that is installed first. Fasteners shall be installed only along the edge or end of the panel that butts and overlaps the panel installed first.

Fasteners shall be located at least 3/8 inch from wallboard panel edges and ends. Nails shall penetrate into wood framing at least 1 1/8 inches. Screws shall penetrate into wood framing at least 5/8 inch. All metal fasteners shall be driven slightly below surface level without breaking the paper or fracturing the core.

Metal trim shall be installed at all free edges of panels, at locations where wallboard panels abut dissimilar materials and at locations shown on the plans. Corner beads shall be installed at external corners. Control joints shall be installed at the locations shown on the plans.

Joints between face panels, the internal angles formed by ceiling and walls and the internal vertical angles formed by walls shall be filled and finished with joint tape and at least 3 coats of joint compound. Tape in the corners shall be folded to conform to the angle of the corner. Tape at joints and corners shall be embedded in joint compound.

Dimples at nail and screw heads, dents, and voids or surface irregularities shall be patched with joint compound. Each patch shall consist of at least 3 coats and each coat shall be applied in a different direction.

Flanges of corner beads, control joints and trim shall be finished with a least 3 coats of joint compound.

Each coat of joint compound shall be feathered out onto the panel surface and shall be dry and lightly sanded before applying the next coat. The finished surfaces of joint compound at the panel joints, internal angles, patches and at the flanges of trim, corner beads and control joints shall be flat and true to the plane of the surrounding surfaces and shall be lightly sanded.

Good lighting of the work area shall be provided during the final application and sanding of the joint compound.

Gypsum wallboard used as backing boards for tile or rigid sheet wall covering or wainscotting shall be water resistant. Joints in backing board shall not be taped or filled and dimples at the fastener heads shall not be patched. Edges of cuts and holes in backing board shall be sealed with a primer or sealer that is compatible with the wall covering or wainscotting adhesive to be used.

Surfaces of wallboard to be textured shall receive an orange peel texture, unless otherwise shown on the plans.

12-9.03 GLASS-MAT FACED GYPSUM BACKING BOARDS

PART 1 - GENERAL

SUMMARY

Section Includes: Fiberglass-mat faced, moisture resistant gypsum backer board.

Related Sections: Section 09 Gypsum Wallboard. Section 05 Cold-formed metal framing.

REFERENCES

ASTM International (ASTM): ASTM C627 Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs. ASTM C1178 Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

SUBMITTALS

Product Data: Manufacturer's specifications and installation instructions for each product specified.

PART 2 - PRODUCTS

MATERIALS

Thickness: 1/2 inch.

Width: 4 feet.

Composition: Gypsum sheathing manufactured in accordance with ASTM C1177 with fiberglass mats both sides and long edges, water-resistant treated core.

Fire resistance: Noncombustible as described and tested in accordance with ASTM E136 and CAN/ULC-S114

Length: 8 feet, 9 feet or 10 feet.

Weight: 1.9 pounds per square foot.

Edges: Square.

Mold Resistance (ASTM D3273): 10, in a test as manufactured.

Permeance (ASTM E96): Not more than 1.0 perms when tiled.

Robinson Floor Test Rating (ASTM C627): Light commercial.

ACCESSORIES

Screws: ASTM C1002, with corrosion resistant treatment.

Joint tape: 2" wide 10x10 fiberglass mesh tape.

PART 3 -EXECUTION

EXAMINATION

Verification of Conditions:

Inspection: Verify that project conditions and substrates are acceptable, to the Installer, to begin installation of work of this section.

INSTALLATION

General: In accordance with ASTM C840 and the manufacturer's recommendations.

PROTECTION

Protect gypsum board installations from damage and deterioration until the date of Substantial Completion.

12-9.04 CERAMIC TILE

PART 1 - GENERAL

SUMMARY

Scope**:** This work shall consist of furnishing and installing ceramic tile in accordance with the details shown on the plans and these special provisions.

Ceramic tile shall include glazed wall tile, patterned porcelain tile, matte porcelain tile, textured porcelain tile, polished porcelain tile, trim tile, setting materials, grouts and such other materials as maybe required for a complete installation.

SUBMITTALS

Product Data:

Manufacturer's descriptive data, a list of materials to be used, and installation instructions for all materials required for the work shall be submitted for approval.

Manufacturer's descriptive data shall be submitted for each type of tile, mortar bed materials, bond coat materials and additives, and grout materials and additives.

Materials list and installation instructions shall include all products and materials to be incorporated into the work.

Friction reports shall be submitted for tile products to be used on floors and other pedestrian surfaces.

Samples**:** Samples shall include 2 individual samples of each type and color of tile and trim to be installed and shall be of the same size, shape, pattern and finish as the tile and trim to be installed.

QUALITY ASSURANCE

Single Source Responsibility**:** Each type and color of tile, grout and setting materials shall be obtained from a single source.

Master Grade Certificates**:** Each shipment of tile to the project site shall be accompanied by a Master Grade Certificate issued by the tile manufacturer.

Certificates of Compliance**:** Certificates of compliance shall be furnished for bond coat materials, setting bed materials and grout in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE AND HANDLING

Delivery**:** Tile and packaged materials shall be delivered to the job site in sealed, unbroken, unopened containers with the labels intact. Tile containers shall bear the Standard Grade label.

Storage and Handling**:** Materials shall be stored and handled in such a manner as to prevent damage or contamination by water, freezing or foreign matter.

PROJECT CONDITIONS

Protection**:** Tile work shall be protected and environmental conditions maintained during and after installation to comply with the reference standards and manufacturer's printed instructions.

Temperatures:

Unless otherwise specified in the manufacturer's installation instructions, the ambient temperature shall be maintained at not less than 50°F nor more than 100°F in tiled areas during installation and for 7 days after completion. Exterior work areas shall be shaded from direct sunlight during installation.

Tile shall not be installed when the temperature of the substrate is greater than 90°F or is frost covered.

Illumination**:** Interior work areas shall be illuminated to provide the same level and angle of illumination as will be available during final inspection.

PART 2 - PRODUCTS

MANUFACTURERS

Available Manufacturers**:** Subject to compliance with the specifications, tile shall be American Olean Tile Co., Inc.; Summitville Tiles, Inc.; United States Ceramic Tile Co.; or equal.

GENERAL

Ceramic Tile:

Ceramic tile shall conform to the requirements in ANSI Standard: A137.1, "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.

Ceramic tile shall conform to the "Standard Grade" requirements.

Tile Installation Materials**:** Tile installation materials shall conform to the requirements in ANSI standard referenced with products and materials indicated for setting and grouting.

Tile Color and Size**:** Tile color shall be as shown on the plans; tile size shall be as indicated in the Schedule elsewhere in this special provision.

Slip Resistant Tile**:** Slip resistant tile shall have sufficient abrasives added such that the static coefficient of friction, wet or dry, shall be not less than 0.6 for walking surfaces and 0.8 for ramps when tested in accordance with ASTM Designation: C 1028.

TILE PRODUCTS

Glazed Wall Tile:

Glazed wall tile shall be machine made, dust pressed white body clay, and shall have a glossy glaze finish, plain face, and cushion edges. Tile shall be 5/16-inch nominal thickness.

Ceramic tile trim shall match material, size and finish of field tile. Free edges of tiled areas of walls shall have bullnose type trim. Outside corners shall have bullnose type runner trim (not beads). Reentrant corners shall have cove type trim.

Patterned Porcelain Tile:

Patterned porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay. Tiles shall have less than 0.5 percent water absorption and be suitable for exterior use. Tiles shall be 3/8-inch nominal thickness. Patterned porcelain shall be slip resistant.

Tile shall have truncated domes, 0.90-inch diameter, 0.20-inch nominal height, and center to center spacing of 2.35 inches. Arrangement of the domes shall be such that there is no break in pattern or spacing when tiles are arranged side by side.

Matte Porcelain Tile:

Matte porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay and shall have a plain face. Tile shall have a nominal thickness of 5/16 inch. Matte porcelain tile shall be slip resist.

Matte porcelain trim tile shall include cove type base at walls and single piece intersecting cove base at corners.

Textured Porcelain Tile: Textured porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay. Tile shall have less than 0.5 percent water retention and be suitable for exterior use. Tiles shall have a nominal thickness of 5/16 inch. Textured porcelain tile shall be slip resistant.

Polished Porcelain Tile: Polished porcelain tile shall be machine made, dust pressed natural porcelain clay. Tile shall have less than 0.5 percent water absorption and be suitable for exterior use. Tile shall have a glossy polished finish and plain face. Tiles shall have a nominal thickness of not less than 5/16 inch.

SETTING MATERIALS

Portland Cement Mortar Installation Materials: Materials for portland cement mortar installation shall conform to the requirements in ANSI Standard: A108.1 as required for installation method designated, unless otherwise indicated.

Membrane: Membrane shall be asphalt impregnated felt conforming to ASTM Designation: D 226, Type I, or polyethylene film conforming to ASTM Designation: C 171, Type 1.1.2. Polyethylene film shall not be less than 4 mils thick.

Reinforcement: Reinforcement shall be galvanized welded wire fabric with 2" x 2"-W0.3 x W0.3 conforming to ASTM Designations: A 82 and A 185 except for minimum wire size. Reinforcement shall be provided in flat sheets.

Metal Lath: Metal lath shall be self furring, galvanized, conforming to ASTM Designation: C 847, flat expanded type weighing not less than 2.5 pounds per square yard. Factory assembled metal lath and paper backing may be used where reinforcement over paper is shown on the plans.

Tile Bond Coat:

Tile bond coat shall be latex-portland cement bond coat.

Latex-portland cement mortar bond coat shall be a prepackaged mortar mix, conforming to ANSI Standard: A118.4, incorporating a dry acrylic resin, and to which only water is added at the job site. Mortar shall be suitable for exterior use and be labeled for the type of tile to be installed.

Epoxy Bond Coat: Epoxy bond coat shall be a 2 part prepackaged epoxy mortar conforming to ANSI Standard: A118.3, suitable for exterior use. Mortar shall be labeled for the type of tile to be installed.

GROUTING MATERIALS

Tile Grout:

Tile grout shall be latex-portland cement grout.

Latex-portland cement grout shall be a prepackaged grout mix, conforming to ANSI Standard: A118.6, incorporating a dry acrylic resin, and to which only water is added at the jobsite. Grout shall be suitable for exterior use and labeled for the type of tile to be installed.

Epoxy Grout: Epoxy grout shall be a 2 part prepackaged epoxy grout conforming to ANSI Standard: A118.3 and suitable for exterior use. Grout shall be labeled for the type of tile to be used.

Grout Pigment: Grout pigment shall be chemically inert, fade resistant mineral oxide or synthetic type. Color shall be as shown on the plans.

SEALANTS

Sealant:

Sealant for vertical expansion joints shall be a medium modulus silicone or polyurethane. Sealant for horizontal joints shall be a 2-part polyurethane type material with a Shore Hardness of 35 to 45.

Color of exposed sealants shall match color of grout in tile adjoining sealed joints.

MORTAR BEDS

Cement Mortar Bed:

Cement mortar bed for walls shall be proportioned of one part cement, ½ part hydrated lime, 6 parts damp sand by volume and only enough water to provide the necessary workability. Ingredients shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than ¾ inch in thickness.

Cement mortar bed for floors shall be proportioned of one part cement, 1/10 parts hydrated lime, 5 parts damp sand by volume and only enough water added to provide the necessary workability. Ingredients shall be dry mixed, water added, and materials blended to produce a stiff mix. Mortar bed shall be not less than 1¼ inches in thickness.

MISCELLANEOUS MATERIALS

Sand: Sand shall be a natural or manufactured sand conforming to ASTM Designation: C 144, except that no more than 10 percent shall pass the No. 100 sieve.

Sealers:

Sealer for unglazed quarry tile shall be water repellent, clear solution of ammonium cementitious compound, silicone base material, or other commercially manufactured sealer.

Sealer for grout shall be a penetrating proprietary compound designed for sealing grout. Silicone sealers shall not be used.

Cement: Cement shall conform to ASTM Designation: C 150, Type I.

Hydrated Lime: Hydrated lime shall conform to ASTM Designation: C 206, Type S, or ASTM Designation: C 207, Type S.

Water: Water shall be clean and potable.

Metal Edge Strips: Metal edge strips shall be stainless steel terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate.

Cementitious Tile Backer Board: Cementitious backer board shall be a backing and underlayment panel composed of a concrete core with glass mesh reinforcing on both faces and conforming to the requirements of ANSI Standard: A118.9.

Shower Pan:

Shower pan shall be flexible polyvinyl chloride (PVC) sheeting conforming to ASTM Designation: D 4551, Grade 40, and manufactured for use as a shower membrane.

Solvent cement shall be as recommended by the manufacturer.

MIXING MORTAR AND GROUT

Mixing: Mortar and grout shall be mixed to comply with the requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grout of uniform quality with optimum performance characteristics for application intended.

PART 3 - EXECUTION

PREPARATION

Concrete, mortar, or masonry substrate surfaces which are to receive a mortar bed shall not vary more than ¼ inch in 8 feet from the required plane and shall be true, plumb at vertical surfaces, and square at intersection edges.

Surfaces to receive a mortar setting bed or a bond coat shall be cleaned adequately to assure a tight bond to the applied material. Such cleaning shall leave the surface thoroughly roughened and free from laitance, coatings, oil, sand, dust and loose particles.

The cleaned surfaces which are to receive a mortar bed shall be saturated with water just prior to placing mortar or the cleaned surfaces shall be coated with fresh neat cement slurry. If the surface is saturated with water, excess water shall be removed and the wetted surfaces uniformly dusted with portland cement. The slurry or wetted cement dust shall be broomed to completely coat the surface with a thin and uniform coating just prior to placing the mortar.

Substrates shall be inspected to insure that grounds, anchors, plugs, recessed frames, bucks, drains, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of the tiles.

INSTALLATION

Tile installation shall conform to applicable parts of ANSI 108 Series of the tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" and Tile Council of American, "Handbook for Ceramic Tile Installation."

All tile shall be installed on a bond coat over a setting bed. The setting bed shall be a cured cement mortar bed or a prepared, dimensionally stable substrate of concrete, masonry, cementitious backer board, or other cementitious material.

The back face of the tile shall be free of paper, adhesives, fiber mesh, resins, or other materials affecting the bond of the tile to the bedding material.

Tile sheets shall have permanent edge bonding or temporary mounting materials on the exposed face. Water soluble or absorbent adhesives shall not be used for edge bonding. Temporary mounting materials shall allow observation during tile setting operations.

Tile work shall extend into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as shown on the plans. Work shall be terminated neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Intersections and returns shall be accurately formed. Cutting and drilling of tile shall be performed without marring visible surfaces. Cut edges of tile abutting trim, finish or built-in items shall be carefully ground to produce straight aligned joints. Tile shall be closely fit to electrical outlets, piping, fixtures and other penetrations such that plates, collars, or covers overlap the tile.

Mortar Bed Placement:

The mortar bed, with or without reinforcement as shown on the plans, shall be placed, consolidated, and finished to the required thickness.

The surface of the mortar bed shall be true and pitched as shown on the plans, without high or low spots. The mortar bed surface shall not vary more than 1/8 inch in 8 feet from a plane parallel to the finished tile surface when tile is installed on a cured mortar bed.

In no case shall the allowed tolerances result in offsets between adjoining tiles, low spots on finished tile surfaces than can pond water, or finished tile surfaces that are not plumb or not true.

Pea gravel mortar shall be tightly compacted so as to fill all voids in the aggregate. Compaction shall be obtained using a stand-up wooden tamper weighing not less than 35 pounds or using a motor driven tamper and leveler.

Pea gravel mortar beds shall be damp cured under cover for not less than 72 hours at a temperature of not less than 70°F.

Cement mortar beds to receive a tile bond coat shall be damp cured under cover for a minimum of 48 hours at a temperature of not less than 70°F.

Cement mortar beds to receive an epoxy bond coat shall be damp cured under cover for a minimum of 96 hours at a temperature of not less than 70°F and allowed to dry thoroughly prior to setting tile.

Cementitious Backer Board: Cementitious backer board shall be installed in accordance with the provisions of ANSI Standard: A118.11.

Shower Pan:

Substrate shall be thoroughly cleaned prior to forming the shower pan. Drain shall be a bolt-down clamping ring type with weepholes, installed such that the lip of the drain is flush with the subfloor.

Shower pan shall be turned up for a distance of not less than 6 inches in room areas and 3 inches above curb level in curbed spaces, with sufficient material to fold over and fasten to outside face of curb. Corners shall be dog-earred and folded between pan and studs. Material shall only nailed in the top inch of the upstand.

Shower pan material shall be cut exactly to size of the drain opening, do not trim out to bolt holes, but pierce to accommodate bolts with a tight fit. Place adhesive or mastic between pan and subdrain.

Tile Bond Coat:

The tile bond coat mortar shall be mixed according to the manufacturer's recommendations. The consistency of the mixture shall be such that ridges formed with the recommended notched trowel shall not flow or slump. Reworking will be allowed provided no water or materials are added. The setting bed surfaces shall be dampened before placing the bond coat as necessary tile installation, but the setting bed shall not be soaked. The setting bed surfaces for epoxy bond coat shall be dry.

The bond coat shall be floated onto the cured mortar bed surface with sufficient pressure to cover the surface evenly with no bare spots. The surface area to be covered with the bond coat shall be no greater than the area that can be tiled while the bond coat is still plastic. The bond coat shall be combed with a notched trowel as recommended by the manufacturer within 10 minutes before installing tile. Tile shall not be installed on a skinned over bond coat.

Installing Tiles:

Tile shall be installed in accordance with the manufacturer's instructions and shall be set solid and shall be well bonded to the substrate.

Tile set on a tile bond coat shall be installed in accordance with ANSI Standard: A108.5, and tile set on an epoxy mortar shall be installed in accordance with ANSI Standard: A108.6.

If tiles are cut, the cuts shall be made with saws. Cut edges shall be rubbed with an abrasive stone to bring the edge of the glaze slightly back from the body of the tile. Cuts shall be accurately made to neatly fit the tile in place. Cut edges shall not be butted against other tile. Cut tile shall be at least half the size of a full size tile.

Tile shall completely cover wall areas behind mirrors and fixtures.

Tile shall be installed so that the finished tile surface does not vary more than 1/8 inch in 8 feet from the finished tile surface shown on the plans. In no case shall there be offsets in adjoining tiles, low spots on finished tile surfaces that can pond water, or finished tile surfaces that are not plumb or true in the completed tile work.

Tiles shall be firmly pressed into the freshly notched bond coat. Tile on interior surfaces shall be tapped and beat into a true surface and to obtain at least 80 percent coverage by the mortar on the back of each tile. Tile on exterior surfaces shall have 100 percent coverage and shall be back-buttered immediately prior to setting the tile.

If tile is face mounted, the paper and glue shall be removed within one hour after tile is installed and all tiles that do not meet the requirements for joints and surface tolerance shall be adjusted or replaced.

Mortar that exudes into the grout spaces between tiles shall be removed to the bottom of tile.

Joints: Joints between tile shall be continuous both vertically and horizontally. Joints shall be straight and of uniform and equal width. Where tiles on adjoining surface are the same size, the joints shall align, one with the other. Joint width shall be as recommended by the tile manufacturer.

Grouting Tile:

Grout shall be mixed, applied and cured in accordance with the manufacturer's recommendations and ANSI Standard: A108.10 for cement grout and ANSI Standard: A108.9 for epoxy grout.

Spacers, strings, ropes, pegs, glue, paper, and face mounting material shall be removed before grouting. Joints between glazed wall tile shall be wetted if they have become dry. Joints for epoxy mortar shall be dry.

Grouting shall not begin until at least 48 hours after installing tile.

A maximum amount of grout shall be forced into the joints between tiles in accordance with the manufacturer's recommendations. The grout shall be finished to the depth of the cushion for cushion edge tile and finished flush with the surface for square edge tile. All gaps and skips in the grout spaces shall be filled.

Mortar or mounting mesh shall not show through the grouted joints.

The finished grout shall have a uniform color and shall be smooth without voids, pinholes or low spots.

Expansion joints shall be kept free of grout or mortar.

Grout shall be protected from freezing or frost for a least 5 days after installation.

Expansion Joints:

Expansion joints shall be installed at the perimeter of all tile floors and at all substrate control joints and changes in the substrate material. Exterior expansion joint spacing shall not exceed 16 feet in any direction.

All expansion joints shall be made with sealant over backer rods. The thickness of sealant at the center of expansion joints shall not exceed the width of the joint. Joint edges shall be primed as recommended by the sealant manufacturer.

Edge Strips: Edge strips shall be installed at openings where the threshold has not been shown on the plans, but where tile floor abuts other flooring materials at the same level. Edge strips shall be installed centered under the closed door, or where there is no door, centered in the opening.

Sounding Tile: Tiled surfaces shall be sounded with a metal bar or chain for improperly bonded tile or setting bed. Tile or setting bed that emits a hollow sound shall be replaced.

Replacement: Cracked, chipped, broken, or otherwise defective tiles shall be removed and replaced. All tiles which differ more than 1/16 inch in elevation from adjacent tile edges shall be removed and replaced.

Curing:

After the installation of tile and the grouting of joints, the tile and grout shall be cured by keeping the surface continuously damp for at least 72 hours after grouting. Curing materials shall not stain the tile or grouted joints. Curing methods shall not erode away the grout.

After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours.

Sealing Unglazed Quarry Tile: Sealer shall be applied to unglazed quarry tile only. The sealer shall be applied in accordance with the manufacturer's recommendations.

CLEANING AND PROTECTION

Cleaning Tile Surfaces:

All exposed tile surfaces shall be cleaned of all grout haze upon completion of grouting. Acids and chemicals used to clean tile shall conform to the tile manufacturer's recommendations. Cleaners shall not be harmful to materials on surfaces of abutting floors, walls, and ceilings. Tile work shall be rinsed thoroughly with clean water before and after using acid or chemical cleaners. After cleaning and rinsing, tile surfaces shall be polished using a soft cloth.

Tile work shall be cleaned and polished again immediately prior to completion of the contract. All dirt, grime, stains, paints, grease, and other discoloring agents or foreign materials shall be removed.

Protection:

After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours after.

Tile surfaces damaged by construction operations shall be retiled.

SCHEDULES

Wall Tile:

Wall tile shall be nominal 4" x 4" glazed wall tile.

Installation on mortar bed, using a tile bond coat and grout, shall conform to the requirements of Method W 222, "Handbook for Ceramic Tile Installation."

Installation on gypsum wallboard, using a tile bond coat and grout, shall conform to the requirements of Method W 243, "Handbook for Ceramic Tile Installation."

Installation on cementitious backer board, using a tile bond coat and grout, shall conform to the requirements of Method W 244, "Handbook for Ceramic Tile Installation."

Installation on concrete and masonry shall be on a mortar bed using tile bond coat and grout, and shall conform to the requirements of Method W 211, "Handbook for Ceramic Tile Installation."

Floor Tile: Floor tile shall be nominal 4" x 4" matte porcelain tile installed on a mortar bed using a tile bond coat and grout and shall conform to the requirements of Method F 112, "Handbook for Ceramic Tile Installation."

12-9.05 DETECTABLE WARNING SURFACE

PART 1 - GENERAL

SUMMARY

This work includes furnishing and installing detectable warning surfaces.

DEFINITIONS

Not Used

SUBMITTALS

Submit manufacturer's descriptive data, color and texture samples, installation instructions, and warranty documentation. Submit 2 samples, each at least 6" x 6".

QUALITY CONTROL AND ASSURANCE

Not Used

WARRANTY

The manufacturer must provide a 5-year warranty for the detectable warning surface, guaranteeing replacement when there is a defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. Begin warranty period upon Contract acceptance.

PART 2 - PRODUCTS

Detectable warning surfaces must be listed on the Department's Pre-Qualified Products List.

Detectable warning surfaces must be prefabricated, flush mounting, truncated dome panels. Dimensions and spacing must be as shown on the plans. The color of the detectable warning must be yellow complying with FED-STD-595, Color No. 33538.

Adhesives, fasteners, and sealant must comply with the manufacturer's instructions.

DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site in the manufacturer’s original and unopened containers that bear labels showing type of material. Package finished surfaces with protective wrappings to protect panels from residue before and during installation.

PART 3 - EXECUTION

Securely install the detectable warning surfaces under the manufacturer's installation instructions.

12-9.06 RESILIENT BASE

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing resilient base in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data, installation instructions, color palette, and samples of resilient base shall be submitted for approval. Samples shall be not less than 12 inches in length.

PART 2 - PRODUCTS

Resilient Base: Resilient base shall be manufacturer's best grade, rubber base, with premolded internal and external corner pieces. The height and color shall be as shown on the plans.

Adhesive: Adhesive shall be as recommended by base manufacturer.

PART 3 - EXECUTION

INSTALLATION

Bases shall be firmly and totally attached to walls with adhesive and shall be accurately scribed to trim, molding and cabinets. All joints shall be tight fitting. Bases between premolded corners or other termini may be installed continuous or installed using 4-foot minimum standard manufactured lengths. Filler pieces shall be not less than 18 inches.

12-9.07 CARPETING

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing sheet carpet, and installation accessories in accordance with the details shown on the plans and these special provisions.

Carpeting and carpeting materials shall be rated by the manufacturer as suitable for heavy pedestrian traffic and as suitable for use under chairs with casters.

SUBMITTALS

Product Data: Provide data on specified products, describing physical and performance characteristics, sizes, patterns, colors available, and method of installation.

Manufacturer’s Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

Maintenance Data: Include maintenance procedures, recommendations for maintenance materials and equipment, and suggested schedule for cleaning.

Samples: Carpet colors will be selected from the manufacturer's standard color and pattern line by the Engineer. After the color and pattern have been selected, one sample of carpet and carpet cushion at least 24" x 24" in size shall be submitted for approval.

QUALITY ASSURANCE

Single Source Responsibility: Materials shall be produced by a single manufacturer for each type of carpet.

Installer Qualifications: Flooring contractor to be a specialty contractor normally engaged in this type of work and shall have prior experience in the installation of these types of materials.

Reference: Backing Material Identification ASTM D 629 Average Finish Pile Weight ASTM 5848 Finish Pile Thickness ASTM 7241 or ASTM 6859, ASTM 5823. Flammability-Small Scale Ignition Test ASTM D 2859 Flammability- Flooring Radiant Panel ASTM 648 Smoke Density ASTM 662 Indoor Air Quality ASTM D 5116.

WARANTY

Special Warranty for Carpet:

Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.

Failures include, but are not limited to:

1. Excessive Surface Wear: More than 10% loss of pile fiber weight
2. Excessive Static Electricity: More than 3.0 kV per AATCC 134
3. Resiliency Loss of the Backing: More than 10% loss of backing resiliency
4. Delamination
5. Edge Ravel
6. Zippering

Warranty Period: 25 years from date of project completion.

DELIVERY, STORAGE AND HANDLING

Delivery: Materials shall be delivered to the job site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number.

Storage: Materials shall be stored in original undamaged packages and containers inside well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

Store materials in area of installation for minimum period of 48 hours prior to installation.

PROJECT CONDITIONS

The maximum amount of moisture evacuation from the floor is 3.0 pounds per 1,000 square feet in 24 hours. The acceptable pH level of the substrate is between 7.0 and 9.0. Contractor is responsible for floor testing.

Maintain minimum 65 degrees F ambient temperature and 65% Relative Humidity for 72 hours prior to, during, and 48 hours after installation.

Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

MAINTENANCE

Maintenance Instructions: Contractor shall furnish the manufacturer's instructions for maintenance of the installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions.

Extra Materials: After completion of the work, not less than 2 percent of each type and color of full size carpet units shall be delivered to the Engineer at the jobsite. Accessories shall be furnished to properly complete the installation. Extra materials shall be packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

SHEET CARPET

Carpet Fiber:

Nylon Fiber: Bulked Continuous Filament (BCF) Nylon in a loop pile construction. Cut pile is not acceptable.

If fiber contains recycled content, report post consumer and post industrial recycled content of the pile face yarn based on total yarn weight i.e. [(Recycle Content in Pile Face Yarn) / (Total Weight of Pile Face Yarn) x 100]

Fiber to contain carbon-core filament for permanent static control. Topical treatments are not acceptable.

Durable stain inhibitor should be applied to the fiber during product manufacturing to resist fiber staining and soiling.

1. Initial: Minimum 500 ppm Fluorine per CRI TM-102
2. After two hot water extractions per AATCC 171: Minimum 400 ppm Fluorine per CRI TM-102

Backing Characteristics:

Primary Backing: Synthetic Non-Woven.

Secondary Backing: ER3 – 100% Recycled Content

1. Density (ASTM D-1667): Min. 65 lbs/cu ft +/- 5%
2. Compression Set (ASTM 1667): Max. 10%
3. Compression Deflection (ASTM 1667): Min. 7 psi @ 25%, Max. 25 psi @ 25%
4. Fully fused secondary backing system that will not delaminate
5. Fully fused secondary backing system that will not delaminate.
6. Provide for a chemically welded seam that is impermeable to moisture and airflow.

Adhesive System: Low VOC, factory applied "dry" adhesive applied to backing and cured during manufacturing.

Performance Characteristics:

Moisture Penetration by impact @ 10psi: No Penetration of backing and seam after 10,000 impacts.

INSTALLATION ACCESSORIES

Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

Adhesives: Products to be supplied with a low VOC, factory applied, "dry" adhesive for "peel and stick" installation.

Edger Strips: Edger and transition strips shall be commercial quality stainless steel or aluminum.

PART 3 - EXECUTION

PREPARATION

Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 3 Section 12-3.01 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

Prepare sub-floor to comply with criteria established in Manufacturer's installation instructions. Use only preparation materials that are acceptable to the Manufacturer.

1. Remove all deleterious substances from substrate(s) that would interfere with or be harmful to the installation.
2. Remove sub-floor ridges and bumps. Fill cracks, joints, holes, and other defects.

Verify that sub-floor is smooth and flat within specified tolerances and ready to receive carpet.

Verify that substrate surface is dust-free and free of substances that would impair bonding of product to the floor.

Verify that concrete surfaces are ready for installation by conducting moisture and pH testing. Results must be within limits recommended by Manufacturer.

There will be no exceptions to the provisions stated in the Manufacturer's installation instructions.

INSTALLATION

Installation- General:

Install product in accordance with Manufacturer's installation instructions.

Verify carpet match before cutting to ensure minimal variation between dye lots.

Layout carpet and locate seams in accordance with shop drawings.

Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic, Minimize cross seam.

Do not locate seams perpendicular through door openings.

Align run of pile *in same direction as anticipated traffic and* in same direction on adjacent pieces.

Locate change of color or pattern between rooms under door centerline.

Provide monolithic color, pattern, and texture match within any one area.

Install carpet tight and flat on sub-floor, well-fastened at edges, with a uniform appearance.

Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

Roll with appropriate roller for complete contact of carpet with mill-applied adhesive to sub-floor. Carpet to be securely adhered in accordance with State Accessibility code requirements.

Trim carpet neatly at walls and around interruptions.

Completed carpet is to be smooth and free of bubbles, puckers, and other defects.

Edger strips shall be installed at free edges.

CLEANING AND PROTECTION

Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. All rubbish, wrappings, debris, trimmings, etc. to be removed from site and disposed of properly.
4. Vacuum carpet using commercial machine with face-beater element.

Remove excess adhesive and/or other from floor and wall surfaces without damage.

Clean and vacuum carpet surfaces using a beater brush/bar commercial vacuum.

Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

12-9.08 PAINTING

PART 1 - GENERAL

Scope: This work shall consist of preparing surfaces to receive coatings, and furnishing and applying coatings, in conformance with the schedules and details shown on the plans and these special provisions.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment specified elsewhere in these special provisions.

DEFINITIONS

Detergent Wash: Removal of dirt and water-soluble chemicals by scrubbing with a solution of detergent and water, and removal of all solution and residues with clean water.

Hand Cleaning: Removal of dirt, loose rust, mill scale, excess base material, filler, aluminum oxide, chalking paint, peeling paint, or paint that is not firmly bonded to the surfaces by using hand or powered wire brushes, hand scraping tools, power grinders, or sandpaper and removal of all loose particles and dust prior to coating.

Mildew Wash: Removal of mildew by scrubbing with a solution of detergent, hypochlorite-type household bleach, and warm water, and removal of all solution and residues with clean water.

Abrasive Blasting:

Removal of loosely adhering paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, shall be by the use of airborne abrasives. Loose particles, dust, and abrasives shall be removed by blasting with clean, oil-free air.

Abrasives shall be limited to mineral grit, steel grit, or steel shot, and shall be graded to produce the surface profile recommended in the manufacturer's data sheet.

Steam Cleaning: Removal of oil, grease, dirt, or other foreign matter by using steam generated by commercial steam cleaning equipment, from a solution of water and steam cleaning compounds, and removal of all residues and cleaning compounds with clean water.

TSP Wash: Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

Water Blasting: Removal of dirt, loose scale, chalking, or peeling paint by low-pressure water cleaning. Water blasting shall be performed in conformance with the requirements in SSPC-SP12 and shall produce a surface cleanliness meeting the requirements of SSPC-SP12-WJ4. Equipment used shall have a minimum flow rate of 1.5 GPM. If a detergent solution is used, it shall be biodegradable and shall be removed from all surfaces with clean water.

Protection:

The Contractor shall provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at the Contractor's expense and the original surface shall be restored.

SUBMITTALS

Manufacturer's descriptive data, a materials list, and color samples shall be submitted for approval.

Product descriptive data shall include product description, manufacturer's recommendations for product mixing, thinning, tinting, handling, site environmental requirements, product application, and drying time.

Materials list shall include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Color samples shall be manufacturer's color cards, approximately 2" x 3", for each color of coating shown on the plans. Color samples for stains shall be submitted on wood of the same species, color, and texture as the wood to receive the stain.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of Compliance shall be furnished when products are required to conform with the requirements of The Society for Protective Coatings (SSPC) in conformance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

REGULATORY REQUIREMENTS

Coatings and applications shall conform to the rules for control of Volatile Organic Compound (VOC) emissions adopted by the air quality control district in the air basin in which the coatings are applied.

SITE ENVIRONMENTAL REQUIREMENTS

Coatings shall be applied in conformance with the environmental constraints specified in the manufacturer's printed instructions. These conditions shall be maintained until the coating has cured and is ready for recoat.

Continuous ventilation shall be provided during application of the coatings.

Adequate lighting, as determined by the Engineer, shall be provided while surfaces are being prepared for coatings and during coating applications.

DELIVERY, STORAGE, AND HANDLING

Products shall be delivered to the site in sealed, labeled containers and stored in a well-ventilated area at an ambient air temperature of not less than 45°F. Container labeling shall include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

MAINTENANCE STOCK

Upon completion of coating work, a full one-gallon container of each type and color of finish coat and stain used shall be delivered to the location at the project site designated by the Engineer. Containers shall be tightly sealed and labeled with color, texture, and room locations where used, in addition to the manufacturer's standard product label.

PART 2 - PRODUCTS

Products for each coating system shall be from a single manufacturer and shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI). Each product shall be shown on the MPI Approved Products List unless otherwise specified in these special provisions.

PART 3 - EXECUTION

INSPECTION

Coatings shall not be applied until surface preparation has been approved by the Engineer. The Contractor shall notify the Engineer at least 3 working days prior to the application of coatings.

SURFACE PREPARATION

Surfaces scheduled to be coated shall be prepared in conformance with the coating manufacturer's printed instructions unless otherwise specified in these special provisions.

Hardware, cover plates, light fixture trim, and similar items shall be removed prior to preparing surfaces for coating. Following the application of the finish coating, the removed items shall be reinstalled in their original locations.

Wood:

Coatings for exterior applications shall have the surface lightly sanded no more than 24 hours prior to the coating application.

A sealer recommended by the coating manufacturer shall be spot applied to knots, sap, pitch, tar, creosote, and other bleeding substances.

After the application of the prime coat, all nail holes, cracks, open joints, dents, scars, and surface irregularities shall be filled, hand cleaned, and spot primed to provide smooth surfaces for the application of finish coats.

Irregularities in wood surfaces to receive a transparent stain finish shall be filled and hand cleaned after the first coat of stain has been applied. The color of the filler shall match the color of the stained wood.

Irregularities in wood surfaces to receive a clear finish shall be filled and hand cleaned before the application of coatings. The color of the filler shall match the color of the coated wood.

Galvanized Metal:

Oils, grease, and fabrication lubricants shall be removed by solvent wash.

New surfaces shall be roughened by hand sanding or light abrasive blasting. Galvanizing shall not be removed during cleaning or roughening.

Damaged or corroded areas shall be cleaned and given 2 spot applications of a coating that conforms to the requirements in the Detailed Performance Standards of the MPI, and listed on MPI List "Number 18, Primer, Zinc Rich, Organic."

Steel and Other Ferrous Metals: Surface shall be cleaned in conformance with the requirements in SSPC-SP 1. Surface profile shall be as required for the coating system specified.

Aluminum and Other Non-ferrous Metals: Surface shall be cleaned in conformance with the requirements in SSPC-SP 1.

Gypsum Board: Holes, cracks, and other surface imperfections shall be filled with joint compound or suitable filler prior to application of coatings. Taped joints and filled areas shall be hand sanded to remove excess joint compound and filler.

Cement Plaster: New plaster shall be cured a minimum of 14 days before coating. Cracks, holes, and surface imperfections shall be filled with patching plaster and hand textured to match adjacent surfaces.

Concrete and Concrete Masonry Unit: New material shall be cleaned and prepared in conformance with the requirements in SSPC-SP 13. Cracks and voids shall be filled with cement mortar patching material. Concrete shall be cured until the surface moisture is below the level specified in the coating manufacturer's printed instructions.

Previously Coated Surfaces:

Dirt, oil, grease, or other surface contaminants shall be removed by water blasting, steam cleaning, or TSP wash. Minor surface imperfections shall be filled as required for new work. Mildew shall be removed by mildew wash. Chalking paint shall be removed by hand cleaning. The surfaces of existing hard or glossy coatings shall be abraded to dull the finish by hand cleaning or light abrasive blasting. Abrasive blasting shall not be used on wood or non-ferrous metal surfaces.

Chipped, peeling, blistered, or loose coatings shall be removed by hand cleaning, water blasting, or abrasive blasting. Bare areas shall be pretreated and primed as required for new work.

APPLICATION

Coatings shall be applied in conformance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness stated in the coating technical data sheet.

Mixing, thinning and tinting shall conform to the manufacturer's printed instructions. After thinning, the coating shall conform to the regulatory requirements in these special provisions.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Materials required to be coated shall have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

Surface Finish Application:

Each coat shall be applied to a uniform finish. Finished surfaces shall be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

Work Required Between Applications:

Each application of material shall be cured in conformance with the coating manufacturer's printed instructions before applying the succeeding coating.

Enamels and clear finishes shall be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer shall be spot applied whenever bleeding substances are visible through the previous application of a coating.

Timing of Applications: The first application of the coating system shall be during the same work shift that the final surface preparation was performed. Additional coats shall be applied as soon as the required drying time of the preceding coat, specified in the coating manufacturer's printed instructions, has been met.

Application Methods:

Coatings shall be applied by brush, roller or spray. Rollers shall be of a type which do not leave a stippled texture in the paint film. Extension handles for rollers shall not be greater than 6 feet in length.

If spray methods are used, surface deviations and imperfections such as overspray, thickness deviations, lap marks, and orange peel shall be considered as evidence the work is unsatisfactory and the Contractor shall apply the remainder of the coating by brush or roller, as approved by the Engineer.

Back Priming:

The first application of the coating system shall be applied to all wood surfaces (face, back, edges, and ends) of wood materials that are not factory coated, immediately upon delivery to the project site. Surfaces of interior finish woodwork that adjoin concrete or masonry shall be coated with one application of exterior wood primer before installation.

Patches in Previously Coated Surfaces: Where patches are made on surfaces of previously coated walls or ceilings, the entire surface to corners on every side of the patch shall be coated with a minimum of one application of the finish coat.

Finishing Mechanical and Electrical Components:

Shop primed mechanical and electrical components shall be finish coated in conformance with the coating system specified for the substrate material. Louvers, grilles, covers, and access panels on mechanical and electrical components shall be removed and coated separately.

Interior surfaces of air ducts which are visible through grilles or louvers shall be coated with one application of flat black enamel, to limit of the sight line.

Conduit, piping, and other mechanical and electrical components visible in the finished work shall be painted.

Both sides and all surfaces, including edges and back of wood mounting panels for electrical and telephone equipment shall be finish coated before installing equipment.

CLEANING

Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

COATING SYSTEM

The surfaces to be coated shall be as shown on the plans and as specified in these special provisions. When a coating system is not shown or specified for a surface to be finish coated, the coating system to be used shall be as specified below for the substrate material. The number of applications specified for each coating system listed herein is a minimum. Additional coats shall be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

SYSTEM 1 - CEMENT PLASTER AND CONCRETE

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

SYSTEM 2- CONCRETE MASONRY UNIT

One Prime Coat:

Block Filler: Latex, Interior/Exterior MPI List Number 4

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11

SYSTEM 3 - GALVANIZED METAL

One Pretreat Coat:

Vinyl Wash Pretreatment.

One Prime Coat:

Galvanized Metal Primer.

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Eggshell-like: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 3, MPI List Number 161
Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163
Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 6, MPI List Number 164

SYSTEM 4 - GYPSUM BOARD

One Prime Coat:

Primer Sealer: Latex, Interior, MPI List Number 50

2 Finish Coats:

Flat: Latex, Interior, MPI Gloss Level 1, MPI List Number 53
Velvet-like: Latex, Interior, MPI Gloss Level 2, MPI List Number 44
Semi-Gloss: Latex, Interior, MPI Gloss Level 5, MPI List Number 54
Gloss: Latex, Interior, MPI Gloss Level 6, MPI List Number 114

SYSTEM 5 - STEEL AND OTHER FERROUS METALS, NON-CORROSIVE ENVIRONMENT

VISIBLE IN FINISHED WORK:

2 Prime Coats:

Shop Primer: Coating meeting the requirements of SSPC-Paint 15
Field Primer: Rust Inhibitive, Water Based, MPI List Number 107

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Eggshell-like: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 3, MPI List Number 161
Semi-Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 5, MPI List Number 163
Gloss: Light Industrial coating, Water Based, Exterior, MPI Gloss Level 6, MPI List Number 164

NOT VISIBLE IN FINISHED WORK:

2 Prime Coats:

Shop Primer: Coating meeting the requirements of SSPC-Paint 15
Field Primer: Rust Inhibitive, Water Based, MPI List Number 107

SYSTEM 6 - WOOD, CLEAR FINISH

2 Finish Coats:

Semi-Gloss: Varnish, Waterborne, Clear, MPI List Number 129
Gloss: Varnish, Waterborne, Clear, MPI List Number 130
Topcoat for Multi-colored coating, Clear, MPI List Number 121

SYSTEM 7 - WOOD, PAINTED

1 Prime Coat:

Primer: Latex for Exterior Wood, MPI List Number 6

2 Finish Coats:

Flat: Latex, Exterior, MPI Gloss Level 1, MPI List Number 10
Low Sheen: Latex, Exterior, MPI Gloss Level 3/4, MPI List Number 15
Semi-Gloss: Latex, Exterior, MPI Gloss Level 5, MPI List Number 11
Gloss: Latex, Exterior, MPI Gloss Level 6, MPI List Number 119

SYSTEM 8 - WOOD, STAINED

One Prime Coat:

Primer: Latex for Exterior Wood, MPI List Number 6

2 Finish Coats:

Solid Hide: Stain, Exterior, Water based, MPI List Number 16

SYSTEM 9 - WOOD, TRANSPARENT STAIN FINISH

2 Finish Coats:

Semi-Transparent: Stain, Exterior, Water based, MPI List Number 156

COLOR SCHEDULE

Colors shall be as shown on the plans.

12-9.09 FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing fiberglass reinforced plastic (FRP) panels and trim molding in accordance with details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data, installation instructions, and finish options shall be submitted for approval.

Product descriptive data shall show the manufacturer's name and shall indicate conformance to these special provisions.

Installation instructions shall show the FRP panel manufacturer's recommended method of installation.

Finish options shall show the manufacturer's standard color palette for FRP panels and trim molding. Color shall be as shown on the plans.

PART 2 - PRODUCTS

FRP Panel: FRP panel shall be Class A flame-spread, minimum nominal thickness of 0.090 inch; Marlite, Class A/I FRP; Kemlite, Fire-X Glasbord; or equal.

Trim Molding: Trim molding shall be manufacturer's standard vinyl molding with nailing flanges and a 3/8-inch deep channel of sufficient width to receive panels and sealant.

Adhesive and Sealant: Adhesive and sealant shall be as recommended by the FRP panel manufacturer.

PART 3 - EXECUTION

INSTALLATION

The FRP panels and trim molding shall be installed in accordance with the manufacturer's installation instructions.

Trim molding shall be nailed through the flange into solid wood backing. All nails shall be concealed by FRP panels in the completed installation. Trim shall be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard trim length. If more than one piece is used on one wall, the pieces shall be approximately equal length, with no piece less than 4 feet in length. All FRP panel edges shall be covered by a trim molding.

Panels shall be one continuous piece along each wall unless the wall length exceeds the manufacturer's standard panel length. If more than one panel piece is used on one wall, the pieces shall be approximately equal length, with no piece less than 4 feet in length.

CLEAN-UP

Adjacent surfaces shall be protected from adhesive or sealant. Excess adhesive and sealant shall be removed as the installation progresses using a solvent or cleaning agent recommended by the FRP panel manufacturer.

12-9.10 SUSPENDED CEILINGS

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing suspended ceilings in accordance with the details shown on the plans and these special provisions.

Suspended ceilings shall consist of lay-in acoustical ceiling panels and an exposed grid suspension system. Listed fire rated assemblies shall be installed where shown on the plans.

Design:

The suspension system shall be designed to support the weight of ceiling panels, lighting fixtures, air terminals, service assemblies and such other items, not mentioned, which are supported by the suspended ceiling system.

The deflection of any component of the suspension system shall not exceed 1/360 of the span.

The suspension system shall be designed for seismic restraint in accordance with ASTM Designation: E 580.

Lighting fixture attachments shall be designed for a capacity of 100 percent of the lighting fixture weight acting in any direction.

SUBMITTALS

Manufacturer's descriptive data and installation instructions and complete working drawings of all supporting details, lighting fixture attachments, lateral force bracing, partition bracing and runner and panel layouts shall be submitted for approval.

QUALITY ASSURANCE

Single Source Responsibility: Obtain tile through one source from a single manufacturer.

PART 2 - PRODUCTS

Acoustical Panels: Acoustical panels shall be factory produced, lay-in panels, 24" x 48" and 24" x 48" x 5/8" thick with SL edges, non-directional natural fissured random perforated or surface texture and factory applied, washable, off-white, vinyl latex finish. Panels shall conform to ASTM E 1264 Type III (mineral base with painted finish), form 2 (water felted). Noise Reduction Coefficient (NRC) shall be minimum 0.65. Panels shall have a flame spread rating not exceeding 25. Tile shall be Armstrong World Industries, USG, or equal.

Suspension System: Suspension system shall be galvanized steel, tee shaped main runners and cross runners and wall molding angles or channels conforming to ASTM Designation: C 635, intermediate duty or heavy duty. Runners shall have exposed flanges approximately one inch wide and positive interlocks between main runners and cross runners. Wall moldings shall have a ¾-inch wide exposed face. Runners and moldings shall be bonderized and shall have a flat off-white color, factory painted finish unless otherwise shown on the plans.

Wire Hangers: Wire hangers shall be 12-gage minimum, galvanized, soft-annealed, mild steel wire.

Assembly Devices, Splices, Intersection Connectors and Expansion Devices: Assembly devices, splices, intersection connectors and expansion devices shall be as recommended by the suspension system manufacturer.

Acoustical Sealant: Acoustical sealant shall comply with requirements under "Sealants" in Section 12-7 of these special provisions.

PART 3 - EXECUTION

INSTALLATION

The suspended ceiling shall be installed square, level and true in accordance with the approved working drawings, the manufacturer's installation instructions and the requirements of ASTM Designations: C 636 and E 580 and UBC Standard No. 25-2.

Hangers for the suspension system shall be spaced at not more than 48 inches on centers and shall be saddle tied or wrapped around the main runner members.

Except as specified herein, all lighting fixtures, air terminals, services or other ceiling supported items shall be positively attached to the suspension system.

Lighting fixtures, air terminals, services or other items weighing less than 56 pounds shall have, in addition to the requirements specified herein, two 12-gage hangers connected from the housing of the fixture, terminal, service or other items to the structure above. These hanger wires may be slack.

Lighting fixtures, air terminals, services or other items weighing more than 56 pounds shall be supported directly from the structure above.

The ceiling shall be leveled to within 1/8 inch in 12 feet.

MAINTENANCE STOCK

Upon completion of the suspended ceiling work, one unopened carton of acoustical panels shall be delivered to a location at the project site designated by the Engineer.

12-9.11 SUSPENDED GYPSUM BOARD CEILINGS

PART 1 GENERAL

SUMMARY

Scope: This work includes non-load-bearing steel framing members for interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

Related Sections: Framing exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists shall conform to the requirements specified under "Cold-Formed Metal Framing" in Section 12-5 "Metals" of the Special Provisions.

SUBMITTALS

Product Data: Submit manufacturer's product data for each type of product indicated.

PART 2 PRODUCTS

SUSPENSION SYSTEM COMPONENTS

Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

Depth: 2 inches

Furring Channels (Furring Members):

Cold-Rolled Channels: 0.0538-inchbare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.

Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

Minimum Base Metal Thickness: 0312 inch

Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

Configuration: Asymmetrical or hat shaped

AUXILIARY MATERIALS

General: Provide auxiliary materials that comply with referenced installation standards.

Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 EXECUTION

EXAMINATION

Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the work and that hangers will develop their full strength.

Coordination with Sprayed Fire-Resistive Materials:

Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

INSTALLATION, GENERAL

Installation Standard: ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw- Attached Gypsum Panel Products," except comply with framing sizes and spacing indicated.

Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 "Standard Practice for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster" that apply to framing installation.

Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 "Standard Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster" that apply to framing installation.

Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board" that apply to framing installation.

Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, or similar construction.

Install bracing at terminations in assemblies.

Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

INSTALLING SUSPENSION SYSTEMS

Install suspension system components in sizes and spacings indicated on the plans, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

Suspend hangers from building structure as follows:

Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards

Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

Do not attach hangers to steel roof deck or permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

Do not connect or suspend steel framing from ducts, pipes, or conduit.

Seismic Bracing: Sway-brace suspension systems with hangers used for support

Installation Tolerances:

Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

12-9.12 LINEAR METAL PANEL CEILINGS

PART 1 - GENERAL

SUMMARY

Scope: This work consists of furnishing and installing linear metal ceiling systems, round edge type panel, including suspension systems and accessories in accordance with the details shown on the plans and these special provisions.

The system consists of prefinished aluminum panels, carries, accessories and provisions for the incorporation of mechanical diffusers and lighting fixtures. The system installations are for both interior and exterior applications.

Design**:** The suspension system shall be designed for seismic restraint, fire resistance, and sound absorption in accordance with the following testing standards:

ASTM C635 and C636: Manufacturing and Installation of Suspended Ceilings.

ASTM E119: Fire Tests of Building Construction and Materials.

ASTM C423: Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

SUBMITTALS

Product Data: For each type of product indicated.

Performance Data: For installed products indicated to comply with design loads and other criteria, include structural analysis and other analytical data signed and sealed by the qualified professional engineer responsible for their preparation.

Samples for Initial Selection: For components with factory-applied color and other decorative finishes.

Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

Linear Metal Pan: Set of 12-inch-long samples of each type and color and a 12-inch-long spliced section.

Suspension System Members: 12-inch-long samples of each type.

Exposed Molding and Trim: Set of 12-inch-long samples of each type, finish, and color.

Filler Strips: Set of 12-inch-long samples of each type, finish and color.

Sound Absorber: 12-inch-long.

End Cap: Full size.

QUALITY ASSURANCE

Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP accredited laboratory with the experience and capability to conduct the testing indicated. NVLAP accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test method specified.

Source Limitations: Obtain each set of linear metal pans and suspension systems from one source with resource to provide products of consistent quality in appearance, physical properties, and performance.

Regulatory Requirements:

Fire Rating Performance Characteristics: Install system to provide a flame spread of 0-25, complying with certified testing to ASTM E 84

Structural Criteria: Install and certify system to comply with structural and wind load requirements of governing codes.

Installation Standard for Suspension System: Comply with ASTM C 636.

Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

Pre-installation Conference: Conduct a conference, prior to start of installation, to review system requirements, shop drawings, and coordination needs.

DELIVERY, STORAGE AND HANDLING

Delivery: Deliver linear metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

Storage: Materials shall be stored in a fully enclosed space above the floor on skids in such a manner as to prevent warpage, scratches or damage of any kind.

Handling: Handle linear metal pans, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

PROJECT CONDITIONS.

Environmental conditions:.

Installation of the linear metal ceiling system shall occur only when temperature and humidity conditions closely approximate the conditions that will exist when area is complete and occupied. Interior conditions for installations require that the building be enclosed with windows and exterior doors in place and glazed, and roof watertight before installation of linear metal ceiling system and related ceiling components.

Interior temperature shall be maintained at not less than 60° F. and not more than 85° F.

All overhead work above the ceiling support system, including electrical, mechanical, and Fire protection lines and/or equipment occurring above ceiling shall be complete prior to the installation of the linear metal ceiling.

MAINTENANCE

Extra Materials

After completion of the work, not less than 2 percent of each type and color of linear metal ceiling components installed, as well as usable scraps, shall be delivered to the Engineer at the job site.

Necessary accessories shall be furnished to properly maintain the installation.

Materials shall be labeled and securely wrapped for storage.

PART 2 - PRODUCTS

MATERIALS

Interior: Shall be fabricated aluminum, roll formed aluminum sheet with round edges, .020 inch thick, open joint, perforated type and fitted with non-woven acoustic tissue and acoustical pad.

Exterior : Shall be fabricated aluminum, roll formed aluminum sheet, round edges, minimum .032 thick, open joint with integral filler. Smooth surface, factory finish in backed enamel paint.

Acoustical Metal Panels Standard:

Provide manufacturer's standard linear metal pans of configuration indicated that comply with ASTM E 1264 classifications as designated by types, acoustical ratings, and light reflectances unless otherwise indicated.

Perforated panels shall have a face width of 3-1/4 inches, 3/4 inch vertical legs with edges formed to snap onto carrier members and be positively locked in place with no additional fasteners.

Filler Strips: shall be Manufacturer's standard material; fabricated to uninterruptedly close voids between pans.

Color shall be selected from the manufacturer's standard color palette after the award of the contract. Preferred color as noted on plans.

Splice plate shall be aluminum with finish color to match panels and formed for snap-fit in butt-cut panel ends.

Closures: Closures shall be as recommended by the ceiling manufacturer. Closures shall be factory finished in matte black.

ACCESSORIES

Trim channel: Trim channel shall be 0.027 inch nominal aluminum, roll-formed into channel shape and factory finished to match panels.

End plugs: End plugs shall be the size and configuration of panel design, factory finished to match panels.

Spacer clip: Spacer clip used to set module and prevent linear movement of panels shall be the manufacturer's standard vinyl clip extruded from matte black vinyl material.

Hanger wire: Hanger wire shall be minimum 12-gage galvanized soft-annealed, mild steel wire unless noted otherwise in manufacturers installation guidelines.

Pan retainer and seismic clips: Pan retainer and seismic clips shall be the manufacturer's standard steel clips to prevent panels from being dislodged from main tee due to impact or seismic events.

Acoustical insulation: Acoustical insulation shall be black Class A acoustical fiberglass material, no surface printing, 1 inch thick, 2 lbs./cu. ft. density, 0.60 Noise Reduction Coefficient (NCR).

Light fixture: Light fixture shall be florescent light from double lamp design of the liner metal ceiling line of accessories.

FABRICATION

Panels: Edges of panels shall be formed to shape to carrier members and provide a positive locking mechanism, and shall be factory finished to match approved samples.

Carrier system**:** Support system shall be formed and fabricated for mechanical connection with adjoining sections and pre-punched holes for direct suspension.

PART 3.- EXECUTION

INSPECTION

Work to be concealed: The Contractor shall verify that all work above the support system is complete, tested in a manner which will not affect layout and installation of the linear metal ceiling system.

PREPARATION

Layout**:** The Contractor shall verify field dimensions and compare with installation drawing prior to installation. Avoid using less-than-half-width or -length pans at borders, and comply with layout shown on reflected ceiling plan.

INSTALLATION

General**:** The linear panel ceiling suspension system shall be installed square, level and true in accordance with the approved working drawings, the manufacturer's installation instructions and the requirements of ASTM Designations: C 636 and E 580 and 2007 California Building Code.

Carrier system:

Symmetrical carriers shall be spaced at 4 foot on centers and secured to main tee with hanger wires or secured directly to structural supports.

Carrier system shall be aligned to be straight, level and in required position.

At the perimeter of the installation, utilize wall angle, channel mold, or edge trim when end caps are not or cannot be utilized.

Vaulted ceiling: Vaulted ceiling shall be installed in accordance with the approved working drawings.

Hanger wires:

Hanger wires shall be spaced at 4 foot center along length of carrier system and attached directly to the building structure above. Hanger wires shall not be attached directly to mechanical or electrical equipment, piping, or other equipment occurring above ceiling.

When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

Ceiling panels:

Panels shall be snapped into position, splice end-to-end with snap-fit splice plates.

Panels shall be installed in alternate rows to permit point access.

Where panel ends are visible, end plugs shall be installed flush with end surface.

Where acoustical material is required, install material across top of ceiling pans between support system members.

FIELD QUALITY CONTROL

Cleaning: Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

12-9.13 STONE VENEER

PART 1 - GENERAL

SUMMARY

Scope: This work includes furnishing and installing simulated stone veneer, mortar and trim in accordance with the details shown on the drawings and these Special Provisions.

REFERENCES

General: Standards listed by reference are part of this specification section to extent indicated. Include revisions by issuing authority.

American Society for Testing and Materials (ASTM):

1. ASTM C91: Specification for Masonry Cement.
2. ASTM C150: Specification for Portland Cement.
3. ASTM C207: Specification for Hydrated Lime for Masonry Purposes.
4. ASTM C270: Specification for Mortar for Unit Masonry.
5. ASTM C387: Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
6. ASTM D226: Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

ICC Evaluation Service (ICC-ES):

1. AC-51: Acceptance Criteria for Precast Stone Veneer.

SUBMITTALS

Product Data: Submit product data for specified products including manufacturer's installation instructions and mortar colors.

Working Drawings and Structural Calculations: Working drawings and Structural Calculations shall be submitted showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures.

Samples: Provide selection and verification samples for finishes, colors and textures.

QUALITY ASSURANCE

Manufacturer Qualifications: Minimum 5 years experience specializing in production of simulated stone veneer.

Installer Qualifications: Minimum 5 years experience in performing work similar to that required for this project.

Mock Up:

1. Provide a mock up of wall with veneer for evaluation of surface preparation, workmanship and finish appearance. Use the finish color, texture and pattern of veneer, and mortar for finished wall surface. Include trim and mouldings. Use the qualified installer, materials, tools, and method for finished wall surface. Build four square feet in area selected by the Engineer.
2. Use test panel as standard of comparison in determining acceptability of remaining installation.

DELIVERY, STORAGE, AND HANDLING

Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store mortar and other moisture-sensitive materials in protected enclosures; handle by methods which avoid exposure to moisture.

PROJECT CONDITIONS

Ambient air temperature must be within manufacturers requirements for installation. Maintain materials and surrounding air temperature at minimum 40°F prior to, during, and for 48 hours after completion of work.

Examine concrete for contaminants (form oil). If present, wash concrete with muriatic acid and rinse thoroughly. High pressure water or sandblasting methods may be used.

PART 2 - PRODUCTS

SIMULATED STONE VENEER

Manufacturers: Provide products that meet the requirements of AC-51.

Stones to be nonstructural concrete veneer, simulating the look and textures of natural stone. Provide uniform look and texture between individual stones. Provide stones between 8 to 15 pounds per square foot.

Trim pieces, ledgerboard and capstone to be same manufacturer and finish as supplied stone veneer.

Random sizes, shapes and textures of finished product must duplicate natural stone. Thickness may vary 1 inch to 3.5 inches depending on the texture.

Colors and textures to be selected from manufacturer's standard products.

RELATED MATERIALS

Mortar:

1. Premixed: Masonry mortar (Type S), must comply with ASTM: C387.
2. Hand Mixed: Portland Cement, must comply with ASTM: C150, Type I. Use lime and masonry sand. Mixture ratio must comply with "Proportion Specifications" in ASTM: C270.
3. Hand Mixed: Masonry Cement, must comply with ASTM: C91, Type S. Use masonry sand. Mixture ratio must comply with "Proportion Specifications" in ASTM: C270.

Lime: Must comply with ASTM: C207, Type S.

Masonry Sand: Must comply with ASTM: C778, standard sand.

Color Pigment for Mortar: Natural or synthetic iron oxides, supplied by simulated stone veneer manufacturer. Not to exceed 10% of cement by weight.

Weather-Resistant Barrier: Asphalt saturated organic felt, must comply with ASTM: D226, Type 1.

Metal Lath: 18 gauge galvanized self furring woven wire mesh, or galvanized 2.5 lb expanded metal lath.

Weep Screed: 26 gauge galvanized foundation flashing, 3-1/2 inches tall. Weep holes every 33 inches maximum on center.

Galvanized Bracket: Galvanized bracket for waterstop trim, minimum holding capacity 5 pounds per linear foot.

Fasteners: For wood studs, galvanized 6d gage nails or 16 gage staples that penetrate the wood a minimum of 1-inch. For metal studs, galvanized #8 self drilling, self tapping screws that penetrate the stud a minimum of 3/8-inch.

PART 3.- EXECUTION

MANUFACTURER'S INSTRUCTIONS

Comply with manufacturer's product data, including product technical bulletins and product installation instructions.

PREPARATION

Apply one layer of weather-resistant barrier with lap joints 4 inches shingle fashion. Wrap weather resistant barrier a minimum of 16 inches around all outside and inside corners.

Attach weep screed with fasteners on 16-inch centers. Attach metal lath with fasteners on 16-inch centers horizontally and 6-inch centers vertically. Wrap metal lath a minimum of 16 inches around all outside and inside corners.

Attach galvanized bracket for waterstop trim on 16-inch centers.

MORTAR MIXES

Mixing: Mortar materials must comply with ASTM: C270 for hand mixed material, or manufacturer's instructions including product data and product technical bulletins for premixed materials. Use quantities needed for immediate use. Do not use anti-freeze compounds to lower the freezing point of mortar.

SIMULATED STONE VENEER INSTALLATION

Mortar:

1. Apply 3/8-inch mortar scratch coat to wall. Work into lath. Drying time is 24 hours.
2. Apply 1/2-inch to 3/4-inch of mortar to surface covering a maximum of 10 square foot at one time, or apply mortar to the entire back of each stone. Press the stone firmly into position in soft mortar bed, wiggle and apply slight pressure to unit to ensure firm bonding by causing mortar to extrude slightly around edges of stones.

Joints:

1. Place stone with uniform mortar joints. Mortar joints should not be over 1/2-inch to 3/4-inch in width. Install outside corner return units with short and long lengths alternated. Remove excess mortar; do not allow mortar to set up on face of stones.
2. Point joints before mortar has set, 3/8-inch maximum depth per lift. Clean and finish joints in accordance with manufacturer's instructions.

Cutting: Perform necessary cutting with proper tools to provide uniform edges; take care to prevent breaking unit corners or edges.

CLEANING

Use a strong solution of granulated soap or detergent and water with a bristle brush. Do not use a wire brush. Rinse immediately with fresh water. Do not clean using acid or acid based products. Do not clean with high pressure power washer. Remove efflorescence, allow stone to dry thoroughly, then scrub vigorously with a stiff bristle brush and clean water. Rinse thoroughly. For difficult efflorescence problems, scrub thoroughly with a solution of 1 part white household vinegar to 5 parts water. Rinse thoroughly.

PROTECTION

Protect materials from rain, moisture, and freezing temperatures for 48 hours after completion of work. Allow no construction activity on opposite side of wall during installation, and for 48 hours after completion of work. Protect installed product and finish surfaces from damage during remainder of construction.

Any work not meeting the requirements shall be redone and retested. Sampling, inspecting, reworking and retesting of material will be done at the contractor's expense.

SECTION 12-10. SPECIALTIES

12-10.01 TACKBOARDS

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing tackboards in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data, color and texture samples and installation instructions shall be submitted for approval. Color and texture will be selected by the Engineer after the award of the contract.

PART 2 - PRODUCTS

Tackboards: Tackboards shall be textured plastic coating on cotton-fabric, pressure laminated to ¼-inch thick cork underlayment. Cork underlayment shall be bonded to a ¼-inch thick hardboard backing. Tackboard dimensions shall be as shown on the plans.

Border Moldings: Border moldings shall be factory applied, extruded clear anodized aluminum trim.

PART 3 - EXECUTION

INSTALLATION

Tackboards shall be installed rigidly, securely, plumb and true, and in accordance with the manufacturer's recommendations.

12-10.02 MARKER BOARDS

PART 1 – GENERAL

Scope: This work shall consist of furnishing and installing a marker boards in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Marker Board:

Marker board shall conform to Porcelain Enamel Institute Standard PEI-S-104, and shall be porcelain enamel surface on 0.024-inch thick (24-gage) sheet steel pressure laminated to ¼-inch thick tempered

hardboard. Hardboard shall have a backing of 0.015-inch nominal thickness aluminum sheet. Enamel surface shall be suitable for marking with felt tipped liquid chalk markers and erasing with a felt eraser or dry cloth. The enamel surface shall be white in color.

Marker board dimensions shall be as shown on the plans.

Trim and marker tray: Trim and marker tray shall be factory installed, satin finish, clear anodized aluminum extrusions.

PART 3 - EXECUTION

INSTALLATION

Marker boards shall be installed rigidly, securely, plumb and true in accordance with the manufacturer's instructions.

12-10.03 METAL TOILET PARTITIONS

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing metal toilet partitions in accordance with the details shown on the plans and these special provisions.

Metal toilet partitions shall consist of panels, doors, pilasters, headrails, urinal screens, fasteners, anchorages and hardware. Internal reinforcement shall be provided at all fasteners, anchorages, hardware and accessories.

Doors, panels, pilasters, and urinal screens shall be stainless steel with a No. 4 satin finish.

SUBMITTALS

Manufacturer's descriptive data, installation instructions and working drawings shall be submitted for approval.

Working drawings shall show the plan layout, door and panel elevations and all details required for the complete installation and anchorage of the partition system.

PART 2 - PRODUCTS

Doors and Panels:

Doors and panels shall be flush, one inch thick, formed of two 0.030-inch (22-gage) Type 304 stainless steel sheets over a honeycomb core. Doors and panels shall have formed edges sealed with a continuous oval crown locking strip, and shall be mitered, welded, and finished at corners.

Doors shall have controlled action hinges, with vertical pintle and ball bearing roller operating on adjustable cams, or moving parts of nylon and stainless steel. Top pivots shall be recessed into edges of doors.

Doors shall be provided with slide bar latch and a combination coat-hat hook and door stop, except as otherwise specified.

Doors on stalls designed for use by the disabled shall be provided with a slide bar latch, combination coat-hat hook and door stop, an automatic door closing device, and U-shaped door pulls immediately below the latch on the inside and outside of the door.

Pilasters: Pilasters shall be 1¼ inches thick, of the same construction as the doors and panels, except face sheets shall be 0.052 inch for galvanized steel and 0.048 inch for stainless steel (18-gage), with adjustable, leveling base incorporating two 3/8-inch diameter stud expansion anchors with leveling nuts.

Urinal Screens: Urinal screens shall be wedge type, wall-mounted, and of the same construction as the doors and panels, except face sheets shall be 0.040-inch (20-gage) minimum thickness. All fasteners shall be concealed.

Fasteners and Anchorages: Fasteners and anchorages shall be stainless steel with vandal resistant heads.

Hardware: Hardware shall be highly polished chromium plated, cast alloy, or heavy duty anodized aluminum.

Pilasters Anchors: Pilasters anchors shall be integral stud anchor type or internally threaded expansion sleeve type with single cone expander. Self-drilling type anchorage shall not be used.

Pilaster Shoes: Pilaster shoes shall be one-piece, stainless steel, with concealed hold down clips, and of sufficient height to completely cover the base and anchors.

PART 3 - EXECUTION

INSTALLATION

Metal toilet partitions shall be installed rigidly, securely, plumb, and true and in accordance with the manufacturer's recommendations. Tops and bottoms of doors shall align with tops and bottoms of panels, and all horizontal lines shall be level.

Rigid backing shall be provided in walls to receive anchorages.

Panels shall be anchored with at least 3 brackets at each wall and pilaster. Two anchors shall be used to fasten each pilaster base to the floor.

Doors shall not bind during opening and closing. The clearance between the door edges and pilasters shall be uniform, equidistant, and shall not exceed 3/16 inch. Hinges shall be adjusted to hold doors ajar when unlatched. Doors on stalls designed for use by the disabled shall return to the closed position.

Drilling, cutting and fitting of wall and floor finishes shall be concealed by the completed installation.

CLEAN-UP

Toilet partitions shall be cleaned, polished and free of all defects. Chipped, dented, scratched, or otherwise damaged work shall be replaced at the Contractor's expense.

12-10.04 LOUVERS

PART 1 - GENERAL

Scope: This work consists of furnishing and installing louvers in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Louvers shall be factory fabricated units of extruded aluminum alloy not less than 0.081 inch thick (12-gage) or galvanized steel sheet not less than 0.064 inch thick (16-gage) with standard "Z" type blades, and removable bronze 16 x 16 mesh insect screens mounted on the inside of the units.

Louver Types:

Double Drainable Operating Louver: Shall be heavy-duty, type, manufactured of 14 gage aluminum, of size, section profile, and configuration indicated, 6-inch deep. Head, sills, and jambs to be one piece structural members of 6063-T52 alloy with integral caulking slot and retaining beads. Mullions shall be sliding interlock with internal drains. Blades to be one piece extrusion thickness with gutters designed to catch and direct water to jamb and mullion drains. The furnishing of all accessories, frame, sill, anchor, and fasteners is required for a complete installation. Operating blades shall have 1/2-inch diameter, zamac alloy pinions operating in self-lubricating nylon bearings. All operating blades shall be operated by concealed drive arms at each jamb and mullion, and assembled with stainless steel shoulder rivets. Drive arms to be interconnected by a 5/8-inch diameter torque bar. All louver blades and sills shall be equipped with vinyl gaskets.

Sightproof Louver: Shall be heavy-duty type, manufactured of 14 gage aluminum of size, section profile and configuration indicated, 4-inch deep. Heads sills and jambs to be one piece structural members of 6063-T52 alloy with integral caulking slot and retaining beads. Mullions shall be sliding interlock type. Blades to be one piece extrusions with reinforcing bosses. All louvers to be furnished with 1/2-inch mesh, .063-inch extruded aluminum frame. Screens and screen frames to be standard mill finish. The furnishing of all accessories, frame, sill, anchor, and fasteners is required for a complete installation.

Fixed blade Louvers: Free area shall be 48 percent

Operable Blade Louvers: Free Area shall be 35 percent. Method of operation shall be hand operation with push bars.

Finish: All exposed aluminum surfaces shall be finished with Duranar or Hylar 5000 PVDF after fabrication with a satin finish, 70 percent fluoropolymer thermo-setting baked coating system which meets or exceeds the requirements of AAMA 0.605.2" Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels." Minimum thickness shall be 1 mil. Color shall be as selected by the Engineer from manufacturer's standard color chart.

Bird Screen: Manufacturer's standard 1/2-inch mesh 0.063-inch aluminum bird screen, mounted in removable extruded aluminum frame and finished as specified for louvers.

Fasteners: Stainless steel, tempered aluminum, or other appropriate tempered steel treated with non-corrodible material as approved by the Engineer.

Gravity units shall have blades center pivoted on a 3/8-inch diameter aluminum rod set in stainless steel ball bearings with cadmium plated races. Blades of gravity louvers shall be equipped with vinyl bulb seals on the edges.

Louvers shall have integral caulking strips and retaining beads.

The finish on louvers shall be baked on primer and fluorocarbon polymeric resin.

PART 3 - EXECUTION

INSTALLATION

Louvers shall be installed in accordance with the manufacturer's instructions. The completed louver installation shall be weather tight.

12-10.05 FLAGPOLE

PART 1 - GENERAL

Scope: This work shall consist of designing, furnishing, and installing a groundset flagpole and foundation in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Flagpole: Flagpole shall be tapered, 35-foot exposed height, 6063-T6 aluminum alloy pole with 6-inch diameter aluminum ball, ball bearing non-fouling truck with aluminum body and 4-inch diameter aluminum sleeves, 9-inch cast aluminum cleat and 5/16-inch polypropylene rope halyards with flag clasps. Aluminum shall be clear anodized after fabrication.

Metal Sleeve, Sand, Wedges and Sealant for Flagpole Foundation: Metal sleeve, sand, wedges and sealant for flagpole foundation shall be as recommended by the flagpole manufacturer. Metal sleeve shall be capped and shall have a ground spike with support plate.

Concrete: Concrete shall be as specified "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions and shall contain not less than 564 pounds of cement per cubic yard.

PART 3 - EXECUTION

The flagpole shall be erected plumb and rigid in accordance with the manufacturer's recommendations. Sand shall be consolidated before placing sealant.

12-10.06 INFORMATION DISPLAY BOARDS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of fabricating, furnishing and installing information display boards in accordance with the details shown on the plans and these special provisions.

Information display boards shall be completely factory assembled, illuminated units with tackboards and weatherstripped removable glazed panels, all in fixed frames.

SUBMITTALS

Product Data: Manufacturer's descriptive data for the component parts shall be submitted for approval.

Working Drawings: Working drawings of the display boards and manufacturer's descriptive data for the component parts shall be submitted for approval.

QUALITY ASSURANCE

Codes and Standards: Fabrication, workmanship and installation shall be in accordance with the standards and specifications established in the latest edition of the "Manual of Millwork," of the Woodwork Institute of California (WIC) and shall conform with the "Custom Grade" requirements of said WIC "Manual of Millwork."

PART 2 - PRODUCTS

MATERIALS

Framing:

Framing shall be clear all heart redwood with rough sawn exposed surfaces and mitered corners.

Rough sawn surfaces shall be produced by resawing, or by grinding rough or dressed lumber across the grain. Such surfaces shall not be the rough surface on lumber as initially produced at the mill.

Fasteners: Fasteners in contact with redwood shall be aluminum, stainless steel or galvanized steel.

Glazing: Glazing shall be clear, mar resistant, coated acrylic plastic sheet, ¼ inch thick, with preformed neoprene or vinyl seals.

Tackboard: Tackboard shall be bulletin board grade, self-sealing, ¼-inch thick corkboard glued to the plywood core. Glue shall be for exterior use and shall be compatible with the materials being adhered.

Plywood Core: Plywood core shall be exterior grade plywood as recommended by the display board manufacturer.

Weatherstripping: Weatherstripping shall be continuous expanded neoprene rod type with continuous nailing tab.

Lighting Fixture and Miscellaneous Hardware: Lighting fixture and miscellaneous hardware shall be as shown on the plans. Louver shall be the egg crate type with plastic lens.

FABRICATION

Shop Assembly: Nails shall be countersunk and the holes filled. Moldings shall be mitered and all joints shall be fitted tight and true.

Shop Finishing:

Wood surfaces shall be coated with stain, unless indicated otherwise on the plans.

The final finish shall be in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

PART 3 - EXECUTION

INSTALLATION

Information display boards shall be installed as shown on the plans.

Hardware shall be adjusted, if necessary, after installation for smooth and easy operation.

12-10.07 INFORMATION DISPLAY CASES

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of fabricating, furnishing and installing information display cases in accordance with the details shown on the plans and these special provisions.

Information display cases shall be completely factory assembled, illuminated units with tackboard and glazed aluminum door and frame and mounted in redwood framing.

SUBMITTALS

Product Data: Manufacturer's descriptive data for the component parts of the display cases shall be submitted for approval.

QUALITY ASSURANCE

Codes and Standards: Fabrication, workmanship and installation shall be in accordance with the standards and specifications established in the latest edition of the "Manual of Millwork," of the Woodwork Institute of California (WIC) and shall conform with the "Custom Grade" requirements of said WIC "Manual of Millwork."

PART 2 - PRODUCTS

MATERIALS

Aluminum Door and Frame: Aluminum door and frame shall be heavy, Type 6063-T5 extruded aluminum. Unit shall be complete with lock, full length piano hinge, glazing and weatherstripping.

Tackboard: Tackboard shall be bulletin board grade, self- sealing, ¼-inch thick corkboard glued to the plywood core. Glue shall be for exterior use and shall be compatible with the materials being adhered.

Plywood Core: Plywood core shall be exterior grade plywood as recommended by the display case manufacturer.

Lighting: Lighting shall be as shown on the plans.

Framing:

Framing shall be clear all heart redwood with rough sawn exposed surfaces and mitered corners.

Rough sawn surfaces shall be produced by resawing, or by grinding rough or dressed lumber across the grain. Such surfaces shall not be the rough surface on lumber as initially produced at the mill.

Fasteners: Fasteners in contact with redwood shall be aluminum, stainless steel or galvanized steel.

FABRICATION

Shop Assembly: Nails shall be countersunk and the holes filled. Joints shall be neatly mitered and fitted tight and true.

Shop Finishing:

Wood surfaces shall be coated with stain unless indicated otherwise on the plans. Coating, if required, shall be completed prior to the installation of the aluminum door and frame.

The final finish shall be in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

PART 3 - EXECUTION

INSTALLATION

Information display cases shall be installed in accordance with the manufacturer's recommendations.

Door and lock shall be adjusted, as necessary, after installation for smooth and easy operation.

12-10.08 METAL SIGNS

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing metal emergency pump shutoff signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data, colors, graphics and fastening details shall be submitted for approval.

PART 2 - PRODUCTS

Signs:

Signs shall be sheet steel, not less than 0.048 inch thick (18-gage) with a baked-on enamel coating.

Signs shall have a white background with contrasting red letters. Red letters shall be 2 inches minimum in height.

Fasteners: Fasteners shall be as recommended by the sign manufacturer.

PART 3 - EXECUTION

Sign inscriptions shall read as shown on the plans.

Each sign shall be located as shown on the plans and shall be fastened in place with a minimum of 6 fasteners for each sign.

12-10.09 SIGNS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data: Manufacturer's descriptive data for sign materials, graphics, and fastening hardware shall be submitted for approval.

Manufacturer's standard color palette for acrylic signs shall be submitted. The Engineer will select background and character colors from the standard color palette.

QUALITY ASSURANCE

Regulatory Requirements: Identification, directional, informational, exit, and accessibility signs and symbols shall conform to the requirements in Identification symbols, 24 CA Code of Regs Pt 2 § 1115B.6, and Signs and identification, § 1117B.5.

Certificate of Compliance: The Contractor shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

PART 2 - PRODUCTS

Sign Colors: The color white shall conform to FED-STD-595, Color No. 17886. The color blue shall conform to FED-STD-595, Color No. 15090. The color black shall conform to FED-STD-595, Color No. 17038.

Signs:

Signs shall be scratch resistant, non-static, fire retardant, washable acrylic laminate with a non-glare surface, not less than 1/8-inch thick.

International symbol of accessibility entrance sign may be a pressure sensitive decal.

Symbols: Symbols shall be scratch resistant, non-static, fire retardant, washable acrylic. Symbol colors shall be in contrast to door color.

Self-Luminous Sign (Exit):

Self-luminous sign shall be internally illuminated, self-luminous exit sign powered by permanent integral tritium gas source. Sign shall be listed by the California State Fire Marshal.

Sign housing shall be ABS molding. Faceplate shall be acrylic.

Fastening Hardware and Material: Fastening hardware and material shall be as recommended by the sign manufacturer. Fasteners shall be noncorrosive.

PART 3 - EXECUTION

INSTALLATION

Signs and symbols shall be fastened or secured to clean, finished surfaces in accordance with the sign manufacturer's instructions. Signs shall be installed at a location and height as shown on the plans.

Metal signs shall be attached securely with galvanized or cadmium plated fasteners.

12-10.10 WARDROBE LOCKERS AND BENCHES

PART 1 – GENERAL

SUMMARY

Scope: This work consists of providing metal lockers and wood benches for locker rooms.

SUBMITTALS

Working Drawings and Product Data: Submit fully detailed Working Drawings and manufacturer's product data of metal lockers and benches, including layout of lockers, color chips, and installation details. Include pedestal anchorage details for benches.

Samples: Submit locker manufacturer's standard color samples for selection. Submit 6 inches by 9-1/2 inches (full width) by 1-1/4 inch samples of finished bench top.

PART 2 – PRODUCTS

Metal Lockers shall consist of the following:

Wardrobe Locker

Metal Storage Locker

Open Metal Bin

Type and Manufacture: Lockers shall be Standard Single Tier or Double Tier and Accessible Single Tier or Double Lockers of width, depth, and height as indicated. Lockers shall be furnished with sloping tops, raised bases, fillers as needed, panel ends, anchors, fasteners, and accessories as required for a complete and finished installation. Lockers shall be manufactured to meet or exceed the following requirements:

Locker Units: Size and configuration as indicated.

Bodies: Minimum 24 gage sheet steel, formed and flanged with stiffener ribs; electrically spot welded. Bolt spacing shall not exceed 9 inches on center.

Do not install mounting fasteners through the bottom of the lower locker unless it is within 1-1/2 inches of the hinge side or the back of the locker.

12-10.11 CANOPY AND AWNINGS

PART 1 GENERAL

SUMMARY

Scope: This work consists of the requirements to engineer, fabricate, and install aluminum canopy and awning systems complete with necessary fasteners, accessories, and trim.

SYSTEM DESCRIPTION

The canopy system consists of extruded aluminum sections (roll-formed not acceptable) that produce the architectural features indicated. System components include of one-piece rigid column and beam assemblies (structural bents), decking, fascia, accessory items and hardware. The canopy system shall be capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water underneath the canopy. Design system to drain water from deck into designated beams and out at grade level of columns through weep holes.

DESIGN REQUIREMENTS

Structural Performance: Provide aluminum canopy system capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under the conditions indicated:

Engineer the aluminum canopy system according to procedures specified in AA ADM 105 "Aluminum Design Manual: Specifications and Guidelines for Aluminum Structures," published by the Aluminum Association.

Design Loads: As required by California Code of Regulations (CCR), Title 24, Part 2, California Building Code, Chapter 16, "Structural Design Requirements."

Wind Load: 90 mph exposure "C"
Snow Load: 20 psf
Live Load: 30 psf
Seismic: See design notes on the plans for seismic design information.

Collateral Loads: Include additional dead loads other than the weight of metal building system for permanent items such as sprinklers, mechanical systems, electrical systems, and service personnel.
Load Combinations: Design aluminum trellis system to withstand the most critical effects of load factors and load combinations.

Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than 1/180 of the span.

Thermal Movements: Provide aluminum canopy system that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Temperature Change (Range): 100 deg F ambient; 150 deg F material surfaces.

SUBMITTALS

Product Data: Submit manufacturer's product data, specifications, component performance data and installation instructions. Provide samples of manufacturer's standard metal finishes for selection by the Engineer.

Working Drawings: Submit detailed drawings, layout of the canopy system, bent locations (identify drain columns and wet bents), and all mechanical joint locations with complete details, connections, jointing and accessories. Include details of concrete footings and bent anchorage.

Calculations: Provide structural calculations for the proposed canopy system stamped and signed by a Civil or Structural Engineer registered in the State of California. The expiration date of the registration shall be shown.

QUALITY ASSURANCE

Qualifications:

Manufacturer Qualifications: The manufacturer firm shall have not less than five (5) years experienced in products or systems similar to the size and complexity indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings of type indicated to metals of types indicated and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with the requirements.

Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance.

Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

DELIVERY STORAGE AND HANDLING

Deliver aluminum canopy components and other manufactures items to the site in unopened cartons, crates, or other protective containers bearing the manufacturer's labels.

Materials delivered to the site shall be immediately unloaded in a manner to prevent bending, warping, twisting, and surface damage.

Store materials in a clean dry environment and cover with suitable weathertight and ventilated covering. Stack canopy system components in a manner to prevent contact with other materials which might cause staining, denting, or other surface damage.

PROJECT CONDITIONS

Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with aluminum canopy system by field measurements before fabrication and indicate measurements on Working Drawings.

COORDINATION

Coordinate installation of anchorages for aluminum canopy system items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

Coordinate installation of aluminum canopy system with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

WARRANTY

Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace aluminum components that show evidence of deterioration of factory-applied finishes within specified warranty period.

Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

Color fading more than 5 Hunter units when tested according to ASTM D 2244.
Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
Cracking, checking, peeling, or failure of paint to adhere to bare metal.

Finish Warranty Period: 10 years from date of project completion.

PART 2 – PRODUCTS

MATERIALS

Aluminum Extrusions: 6063 alloy heat treated to a T-6 temper and not less than the strength and durability properties specified in ASTM B221 for 6063-T6.

Roof Deck: Extruded aluminum shapes, interlocking self-flashing sections.

Fascia: Manufacturer's standard extruded aluminum fascia sections as indicated and as required to complete the installation resulting in a neat finished appearance.

Flashing: Aluminum sheet, thickness as recommended by manufacturer for specific condition.

Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.

Structural Bolts: ASTM F593; alloy 304 with nuts and washers of same material.

Fasteners for Roof Deck: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal roof panels.

Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.

Blind Fasteners: High-strength aluminum or stainless-steel rivets.

FABRICATION

General: Fabricate aluminum canopy components to comply with indicated profiles, dimensions and structural requirements and the approved working drawings. Fabricate sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.

Shop Assembly: Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

Bents: Fabricate frame bents of shop welded one piece units. When size of bents does not permit shipment as a welded unit, fabricate with concealed mechanical joints.

Roof Deck: Shop fabricate to lengths and panels widths required for field assembly. Provide shop-induced camber in deck units as required to meet design requirements. Provide welded dams are at non-draining ends of deck.

Aluminum Finishes: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin (PVDF) by weight; complying with AAMA 2605.

PART 3 – EXECUTION

EXAMINATION

Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

Before erection proceeds, survey elevations and locations of concrete and masonry-bearing surfaces and locations of anchor rods, base connector plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and aluminum system manufacturer's tolerances.

Proceed with erection only after unsatisfactory conditions have been corrected.

PREPARATION

Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place, unless otherwise indicated.

ERECTION OF STRUCTURAL FRAMING

General: Erect aluminum canopy system according to AA ADM 105 "Aluminum Design Manual: Specifications and Guidelines for Aluminum Structures," and manufacturer's written erection instructions and erection drawings.

Do not field cut, drill, or alter structural members without written approval from aluminum canopy system manufacturer's professional engineer.

Set structural framing accurately in locations and to elevations indicated. Maintain structural stability of structural bents during erection. Erect framing true to line, level, plumb, rigid, and secure.

Install roof deck sections, accessories and related flashing in accordance with manufacturer's instructions. Provide roof slope for rain drainage without ponding water. Align and anchor roof deck units to structural support frames.

CLEANING AND PROTECTION

Damaged Units: Replace roof deck panels and other components of the work, which have been damaged or have deteriorated beyond successful minor repair.

Cleaning: Remove protective coverings at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by the manufacturer. Maintain in a clean condition during construction.

12-10.12 FREE STANDING STEEL SHELVING

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing free standing steel shelving in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data, installation instructions and standard color palette shall be submitted for approval. The color will be selected by the Engineer after the award of the contract.

PART 2 - PRODUCTS

Shelving: Shelving shall be factory fabricated steel shelves and supports capable of supporting loads of 25 pounds per square foot of shelf area. Shelves shall not deflect more than 5/16 inch when subjected to the loads specified herein and shall show no permanent deflection after removal of such loads. Shelves shall be supported and attached by means of clips. Studs or bolts shall not be used. Shelves shall be adjustable in vertical increments of 3 inches or less. Shelving shall be of the approximate dimensions and number shown on the plans and shall have a baked enamel finish.

PART 3 - EXECUTION

Free standing steel shelving shall be installed in accordance with the manufacturer's instructions.

12-10.13 CANTILEVER STEEL SHELVING

PART 1 - GENERAL

This work shall consist of furnishing and installing cantilever steel shelving in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Shelving: Shelving shall be factory fabricated shelves and supports capable of supporting loads of 20 pounds per square foot of shelf area. Shelves shall not deflect more than 5/16 inch when subjected to the loads

specified herein and shall show no permanent deflection after removal of such loads. Shelves shall be adjustable in vertical increments of 3 inches or less. Shelving shall be of the approximate dimensions and number shown on the plans and shall have a factory applied baked enamel finish. The color shall be gray.

PART 3 - EXECUTION

Cantilever steel shelving shall be installed and fastened in accordance with the manufacturer's instructions. The completed installation shall be rigid and secure.

12-10.14 TOILET AND SHOWER ACCESSORIES

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing toilet and shower accessories in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data: Manufacturer's descriptive data, installation instructions, and details shall be submitted for approval.

QUALITY CONTROL AND ASSURANCE

Regulatory Requirements: Accessibility products shall conform to Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Publicly Funded Housing, 24 CA Code of Regs Pt 2 §§ 1101B-1135B. Grab bars and folding shower seats shall conform to Grab bars, tub and shower seats, 24 CA Code of Regs Pt 2 § 1115B.7.

Certificates of Compliance: Certificate of Compliance shall be furnished for grab bars and folding shower seat in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Certificate of Compliance shall include written confirmation that the grab bars and folding shower seat, backing, mounting devices, fasteners and their installation conform to the requirements in Structural strength, 24 CA Code of Regs Pt 2 § 1115B.7.2.

PART 2 - PRODUCTS

Toilet Tissue Dispenser: Toilet tissue dispenser shall be dual roll, surface mounted, stainless steel with satin finish, and approximately 6" x 11-1/2" x 6" in size. Dispenser shall utilize standard toilet tissue rolls. The top roll shall automatically drop into place after the bottom roll is depleted. One dispenser per toilet stall.

Combination Paper Towel Dispenser and Waste Receptacle: Combination paper towel dispenser and waste receptacle shall be semi-recessed, stainless steel with satin finish, and approximately 17" x 56" x 7-1/2" in size with 4-inch skirt. The paper towel dispenser shall have a capacity of 1,000 single fold paper towels. The waste receptacle shall have a capacity of at least 8 gallons. Quantity shall be as shown on the plans.

Toilet Seat Cover Dispenser: Toilet seat cover dispenser shall be surface mounted, stainless steel with satin finish, approximately 15" x 11-1/2" x 2" in size. One dispenser per toilet stall and wheelchair accessible compartment.

Napkin Receptacle: Napkin receptacle shall be surface mounted, stainless steel with satin finish, hinged top and bottom, approximately one-gallon capacity container with disposable liner. One receptacle per women's toilet stall.

Waste Receptacle: Waste receptacle shall be surface mounted, stainless steel with satin finish, and a capacity of at least 12 gallons. One receptacle per toilet room.

Clothes Hook: Clothes hook shall be stainless steel with two prongs. Quantity shall be as shown on the plans.

Paper Towel Dispenser: Paper towel dispenser shall be surface mounted, stainless steel with satin finish, with a capacity of 1,000 single fold paper towels. One dispenser per lavatory.

Liquid Soap Dispenser: Liquid soap dispenser shall be surface mounted, heavy-duty plastic dispenser for industrial use with a capacity of at least 24 ounces. Maximum operating force shall be 5 pounds. One dispenser per lavatory.

Powdered Soap Dispenser: Powdered soap dispenser shall be surface mounted, white enameled sheet steel dispenser with a capacity of at least 30 ounces. The dispenser shall have an adjustable soap dispensing mechanism and a lockable top. Maximum operating force shall be 5 pounds. One dispenser per lavatory.

Mirror, Wall Hung: Mirror, wall hung shall be Number 1 quality, 1/4-inch thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror shall have a heavy gage galvanized steel back and stainless steel frame. The frame shall have a satin finish and shall be mitered and welded and the corners shall be ground smooth. Fasteners shall not penetrate surfaces of the frame exposed to view. Mirror shall be guaranteed against silver spoilage for not less than 10 years. Quantity shall be as shown on the plans.

Grab Bar: Grab bar shall be stainless steel with satin finish, and concealed, integral mounting flanges.

Combination Soap Dispenser-utility Shelf: Combination soap dispenser-utility shelf shall be stainless steel with satin finish. Liquid soap dispenser shall have a capacity of at least 100 ounces and an unbreakable refill indicator. Maximum operating force shall be 5 pounds. Quantity shall be as shown on the plans.

Folding Shower Seat: Folding shower seat shall be factory fabricated in teakwood or solid phenolic with drainage slots, Type 304 stainless steel tube frame with satin finish, wall bracket, and hinge. Teakwood slats shall be factory stained and varnished.

Shower Curtain: Shower curtain shall be flame resistant, one-way draw, nylon reinforced, anti-bacterial vinyl fabric. Curtain shall be approximately 72 inches x 72 inches.

Shower Curtain Rod: Shower curtain rod shall be stainless steel, fixed mounted shower rod with stainless steel mounting plates.

PART 3 - EXECUTION

INSTALLATION

Toilet and shower accessories shall be installed in accordance with the manufacturer's recommendations. Fasteners for mounting accessories shall be concealed and vandal resistant.

Expansion anchors shall be used for mounting accessories on masonry or concrete walls.

Toilet and shower accessories shall be mounted after painting work is complete.

All toilet room accessories shall be mounted plumb, secure, and rigid.

Grab bars, folding shower seats, and their fasteners shall be installed in conformance with the requirements in Grab bars, tub and shower seats, 24 CA Code of Regs Pt 2 § 1115B.7. as follows:

The structural strength of grab bars and shower seats, fasteners, and mounting devices shall meet the following specifications:

Bending stress in a grab bar or seat induced by the maximum bending moment from the application of a 250-pound point load shall be less than the allowable stress for the material of the grab bar or seat.

Shear stress induced in a grab bar or seat by the application of a 250-pound point load shall be less than the allowable shear stress for the material of the grab bar or seat, and its mounting bracket or other support is

considered to be fully restrained, then direct and torsional shear stress shall not exceed the allowable shear stress.

Shear force induced in a fastener or mounting device from the application of a 250-pound point load shall be less than the allowable lateral load of either the fastener or mounting device or the supporting structure, whichever is the smaller allowable load.

Tensile force induced in a fastener by a direct tension force of a 250-pound point load, plus the maximum moment from the application of a 250-pound point load, shall be less than the allowable withdrawal load between the fastener and supporting structure.

Grab bars shall not rotate within the fittings.

In addition, the mounting devices shall be fully recessed type, flush with the surface of the supporting wall studs. Except that grab bars are made as an integral part of pre-fabricated toilet stall partitions or pre-fabricated shower enclosure, the Contractor shall submit evidence of engineering calculations signed by a civil engineer licensed in this state, indicating the proposed products of grab bars, folding seats, fasteners, and mounting devices have met the above code requirements of structural strength.

12-10.15 TRUCK STATIC WEIGHING SYSTEM

PART 1 - GENERAL

Scope: This work shall consist of furnishing, installing and constructing a truck static weighing system in accordance with the details shown on the plans and these special provisions.

The truck static weighing system shall include construction of a scale pit structure, scale pit drainage system.

The general location of the scale pit and the sump pump piping system for the truck weighing system shall be as shown on the plans.

Manufacturer Representation: The Contractor shall provide that a technical representative of the truck scale manufacturer be on call and available at the jobsite within 24 hours of being contacted during the construction, installation, adjusting and testing of the truck static weighing system. The technical representative shall have full and complete knowledge of the installation and operation of the scale being installed.

RULES AND REGULATIONS

The truck weighting system static platform scale and electronic weighing equipments shall meet the specification and tolerances provided in Title 4, Chapter 9, of the California Administrative Code and shall have the "type of approval" required by Division 5, Section 12500.5, of the California Business and Professions Code. The static weighing platform scale and weighing equipment shall be operationally compatible and sealable. The Contractor shall make all arrangements, pay for all fees, and perform all work required for getting the weighing equipments officially sealed by the local County "Department of Weights and Measurements" in accordance with the examination procedures required by the California Department of Food and Agriculture, Division of Measurement Standards.

SUBMITTALS

Working drawings shall include complete details of the scale deck and load cell assembly, including details of concrete, reinforcement and the steel deck forming; size and location of steel support members; and details of bumpers. Working drawings shall also include any modifications to the scale deck and scale pit details shown on the plans which may be required to accommodate the truck weighing system being installed.

PART 2 - PRODUCTS

Truck Scale: Truck scale shall be the fully electronic type and shall be 50-ton axle load scales 12 feet wide by 12 feet long with a 50-ton per section concrete deck weigh bridge. Scale shall be four corner load cell type complete with all equipment and appurtenances. Truck scale shall meet the requirements shown on the plans.

Sump Pump: The sump pump shall be a close coupled submersible type with 1¼-inch minimum diameter discharge, integral thermal overload protection and Type SO cable. The pump and motor shall be assembled on a single vertical stainless steel shaft fitted with a mechanical seal. The pump control shall be a diaphragm liquid level controller and shall be attached to the sump pump with Type SO cable if externally wired. Horsepower rating, voltage, phase, RPM, and flow and total dynamic head characteristics shall be as shown on the plans.

Concrete and Reinforcement: Concrete and reinforcement shall be as specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

Truck Static Scale Electrical: Truck scale electrical shall be as specified under "Truck Static Scale Electrical" in Section 12-16, "Electrical," of these special provisions.

PART 3 - EXECUTION

INSTALLATION

The truck weigh scale assemblies and electronic weighing equipment shall be installed in accordance with the manufacturers' instructions and the approved working drawings.

The truck scale platform shall be installed so that the elevations of the 4 corners do not vary more than 0.01 foot from the highest point to the lowest point. The scale platform shall be also installed so that the difference in elevation between the adjoining surfaces of the platform and the approach and exit slabs does not exceed 0.005 foot.

Valves and unions shall be installed horizontally and a minimum of 3 feet above the scale pit floor.

CLEANING AND PAINTING

Surfaces of structural steel for the scale shall be cleaned and painted in accordance with the requirements specified in Section 59-1, "General," and 59-2, "Painting Structural Steel," of the Standard Specifications.

SECTION 12-11. EQUIPMENT

12-11.01 PRESSURE WASHER

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a pressure washer and accessories in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive data for a pressure washer, accessories, and equipment shall be submitted for approval.

Manufacturer's descriptive data shall include a complete description, performance data and installation instructions for the materials and equipment specified herein.

CLOSEOUT SUBMITTALS

Operation and Maintenance Manuals: Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

WARRANTY

Warranties and Guarantees: Manufactures warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2 - PRODUCTS

MANUFACTURERS

Acceptable Manufacturers: Subject to compliance with the requirements, pressure washer shall be Hotsy, Model No. 550; Landa, Model No. PHW2-1100; or equal.

MANUFACTURED UNITS

High Pressure Washer:

Pressure washer shall be gasoline engine. The washer shall have a capacity of not less than 132 GPH of hot water solution at 1,000 psi.

Pressure washer shall be equipped with a 150°F maximum adjustable temperature controller, ON/OFF pump motor and water heater switches, safety controls, safety valve, vent stack, and the following accessories: swivel cleaning gun with trigger control and 30-inch extension; wire braid hot water hose, 3/8-inch inside diameter, rated at not less than 3,000 psi working pressure, 50 feet in length with safety coupling; adjustable spray nozzle with spray pattern from 0 to 80 degree spray pattern.

PART 3 - EXECUTION

INSTALLATION

The high pressure washer shall be installed in accordance with the manufacturer's recommendations.

FIELD QUALITY CONTROL

Testing:

Testing of the pressure washer shall be conducted by the Contractor in the presence of the Engineer.

The Contractor shall notify the Engineer in writing not less than 5 days prior to the time that testing is to be conducted.

12-11.02 DISPOSER

PART 1 - GENERAL

SUMMARY

This work shall consist of furnishing and installing a disposer as shown on the plans and these special provisions.

SUBMITTALS

Manufacture's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Disposer (Commercial vehicle enforcement facility, Break room): Disposer shall be ½ HP, 110 Volts, 60 Hertz, Single-phase commercial duty Waste King 500-1, In-Sink-Erator SS-50, or equal.

PART 3 - EXECUTION

Installation shall be as recommended by the manufacturer.

12-11.03 BUILT-IN MICROWAVE OVEN AND RANGE HOOD

PART 1 - GENERAL

SUMMARY

This work shall consist of furnishing and installing a built-in microwave oven and range hood as shown on the plans and these special provisions.

SUBMITTALS

Manufacture's descriptive data and installation instructions shall be submitted for approval.

PART.2.-.PRODUCTS

Microwave Oven:

Microwave oven shall be over-the-range, built-in with a 300 cfm ventilation system, 1,000 watt minimum, stainless steel.

Units shall be KitchenAid KHHC2090S, LG LMV1680ST, Whirlpool MH3184XPS or equal.

Range hood:

Range hood shall be stainless steel construction, have integral ventilator with minimum airflow of 450 cfm exhausting through a 6 inch minimum discharge vent.

Range hood shall be Broan Rangemaster Ballista 6100, Faber Synthesis 6300, or equal.

PART 3 - EXECUTION

Installation shall be as recommended by the manufacturer.

12-11.04 COMPRESSED AIR SYSTEM

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing compressed air systems in accordance with the details shown on the plans and these special provisions.

The compressed air system shall include a compressor, regulators, gauges and compressed air piping.

Pipes and fittings shall be in accordance with the requirements specified under "Pipes, Fittings, and Valves," in Section 12-15, "Mechanical," of these special provisions.

Permits to Operate:

Attention is directed to the latest Division of Industrial Safety (DIS) regulations regarding tank mounted air compressors.

The Contractor shall provide all permits to operate pressure vessels in accordance with the requirements of the DIS and shall pay all costs for such permits. Such permits shall be posted under glass at the work site.

SUBMITTALS

Product Data:

Manufacturer's descriptive data shall be submitted for approval.

Manufacturer's descriptive data shall include a complete description, performance data and installation instructions for the materials and equipment specified herein.

CLOSEOUT SUBMITTALS

Operation and Maintenance Manuals: Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

WARRANTY

Warranties and Guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2 - PRODUCTS

OVERHEAD HOSE REEL ASSEMBLIES

Overhead hose reel assemblies shall be heavy duty assemblies of steel construction with connecting hoses, locking automatic ratchets, guide rollers and heavy duty spring activated hose pickups. Reels shall have bushings, swivels, ball stops, delivery hoses and control valves. The reels shall have a baked enamel finish. Manufacturers reel mounting brackets shall be supplied with reels.

MISCELLANEOUS COMPONENTS

Light Reel Assembly: Light reel assembly shall be overhead type light reel with a positive reel latch cord lock mechanism, release mechanism, reel cord retractor, 30-foot minimum length of 3-wire cord, 2-foot pigtail, ball stop, vapor-tight high impact phenolic plastic holder without switch or receptacle with heavy duty lamp guard and 100-watt incandescent bulb or l5-watt fluorescent tube. The incandescent light reel assembly shall be Alemite, 330005C; or equal. The fluorescent light reel assembly shall be Hi Reel, 3005-AFL; Woodhead, 945-3SW-1003-3S; or equal.

Air Compressor: Air compressor shall be 2-stage, 175 psig design, 125 psi output, mounted on an ASME code horizontal type receiver. The air compressor shall be complete with unloader, V-belt drive, belt guard, oil and air pressure gauges, automatic pressure controller, outlet valve, ASME relief valve, air intake filter, ball valve drain and an automatic tank drain operated by either the compressor unloader or a governor. Motor shall be

high efficiency type, open dripproof with class B insulation. Air compressor shall be Champion, Ingersol Rand, Kellogg, or equal.

Pressure Regulator:

Pressure regulator shall be combination type with filter, bowl, pressure regulator and pressure gauge.

The filter bowl shall be the quick disconnect type, plastic with metal guard, manual drain, and 5-micron filter.

Pressure regulator shall be diaphragm controlled, balanced valve type, rated for 0 to 160 psig operation and shall be equipped with pressure gage, bottom clean-out plugs and internal strainers. Regulator shall be Wilkerson, Lincoln, Wabco, or equal.

Flexible Coupling: Flexible coupling shall be brass flexible metal hose with threaded union ends and a minimum working pressure of 200 psig.

Pressure Gage: Pressure gage shall be rotary type ANSI Standard: B40.1, Grade A, with 3½-inch dial, liquid filled with cover, plain case, reset screw and bottom inlet. Pressure gage movement shall be phosphor bronze bushed. Gage shall read from 0 psi to 200 psi. Each gage shall be equipped with a gage cock. Pressure gage shall be Marsh, Ashcroft, US Gage, or equal.

PART 3 - EXECUTION

INSTALLATION

The hose reels shall be installed rigidly and securely to the reel mounting bracket. The mounting bracket shall be attached to the overhead structure as shown on the plans.

Air compressor shall be installed with drain piping, vibration isolation pads and expansion anchors.

Unions shall be installed before and after the pressure regulator/ball valve assembly.

FIELD QUALITY CONTROL

Testing:

All tests, including general performance tests to demonstrate the proper operation of the air compressor, shall be performed by the Contractor in the presence of the Engineer.

The air compressor system shall be tested for the operational range, the cut-off pressure and the operation of air drops and system components.

The lubrication system, including piping and hoses, shall be tested for leaks and the rates of delivery specified herein. The lubrication connections shall show no visible signs of leaks when the system is filled with the specified lubricant and tested at 150 psi lubricant pump inlet air pressure.

The Contractor shall demonstrate that the completed lubrication system will deliver the given product at the flowrate and discharge pressure specified by the pump assembly manufacturer. If no specification is given the lubricants shall be delivered at the following rates at 150 psi lubricant pump inlet air pressure:

The required delivery rate values may be adjusted, as determined by the Engineer, when testing for delivery rates with different materials or at temperatures other than 70°F.

The drums and lubricating material for testing the lubrication system will be State-furnished as provided under "State-Furnished Materials" in Section 8, "Materials," of these special provisions.

12-11.05 EXHAUST EVACUATION HOSE REEL AND FAN

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing exhaust evacuation hose reel and fan equipment, including overhead fume exhaust fan, hose reel, hose and remote operating station. All work shall be done in accordance with the details shown on the plans and these special provisions.

Supports, Mechanical and Electrical work and all other work incidental to, and necessary for, the proper installation and operation of the items of equipment shall conform to the requirements specified for similar work elsewhere in these special provisions.

SUBMITTALS

Product Data: Manufacturer's description data, installation recommendations, working drawings, schematic diagram, interconnection diagram, including reel installation mounting brackets, shall be submitted for approval. Fan, hose reel and push button station shall be from same manufacturer. System shall be Nederman, CarMon or equal.

PART 2 - PRODUCTS

Exhaust Evacuation Fan: Exhaust evacuation fan shall be centrifugal AMCA certified exhaust fan suitable for diesel or gasoline powered vehicle exhaust applications. Fan parts exposed to air stream shall be coated to prevent acid corrosion. The exhaust evacuation fan shall be mounted with vibration isolators on the reel. The fan size and performance shall be as shown on plans.

Hose Reel Assembly: Hose reel assembly shall be provided with 30 feet minimum of 6-inch diameter flexible hose. The hose reel shall be motor operated and shall be capable of unwinding and recoiling the hose from a remote operating station. All electrical equipment necessary for operation shall be mounted on the hose reel assembly except for the remote operating station. The hose reel motor shall be interlocked with an adjustable limit switch that stops the reel when the tubing has been fully extended or fully retracted.

Hose: Exhaust hose shall be fabricated of a high strength woven glass fiber cloth supported by a helically wound spring steel wire. The hose shall be capable of withstanding temperatures of 300°F and shall be supplied with a rubber nozzle of the same size as hose provided.

Pushbutton Station: Pushbutton operating station shall consist of a 3 button (up, down, on/off) controller wired directly to the hose reel assembly. The up and down buttons shall be momentary push button type.

Control Panel:

Control panel shall be a complete system routinely advertised, furnished and guaranteed by the exhaust evacuation hose reel and fan manufacturer.

Control panel shall include circuit breakers, starters, fan motor contactor, power supply, limit switch and controls that are required for proper operation.

PART 3 - EXECUTION

INSTALLATION

The exhaust evacuation hose reel and fan shall be installed in accordance with the manufacturer's recommendations. The exhaust evacuation units and pushbutton station shall be located as shown on the plans.

FIELD QUALITY CONTROL

Testing: The test shall consist of a general performance test to demonstrate the proper operation of the exhaust evacuation hose reel and fan system. The test shall be performed by the Contractor in the presence of the Engineer.

12-11.06 INSPECTION PIT COVER

PART 1 - GENERAL

SUMMARY

This work shall consist of furnishing and installing mechanically moving pit covers in accordance with the details shown on the plans and these special provisions.

The pit covers system shall include operators, controls, cover, and necessary hardware.

SUBMITTALS

Product data: Manufacturer's product data shall be submitted for all manufactured materials and equipment. Manufacturer's product data shall include catalog cuts, complete description, performance data, and installation instructions.

Working Drawings: Working drawings for pit covers shall be submitted for approval. Drawings shall show elevations, assembly and installation.

Operation and Maintenance Manuals: Prior to completion of the contract, three identified copies of all the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Manuals that are inadequate or incomplete will be returned and the Contractor shall resubmit adequate and complete manuals at no expense to the State.

WARRANTY

Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2 - PRODUCTS

PIT COVER ASSEMBLIES

General: Pit cover assemblies shall be heavy duty assemblies with roll-up canisters, factory-assembled, stainless steel covers , safety reversing edges, audible alarm and light, tracks, concrete anchors, and any other hardware necessary for the proper operation of the pit cover system.

Pit Cover Operator:

Pit Cover Operator shall be gear motor with gearbox assembly and brake, with NEMA 4 stainless steel housing, suitable for operating the submitted pit covers. One operator per cover. Approved for use by a nationally recognized testing laboratory in accordance with the requirements of UL 325, fifth edition and UL 991, second edition.

Operators shall be designed and manufactured for continuous duty. Pit cover drive shaft, chain, chain sprocket and gears shall be 304SS

The unit shall be 208V, three-phase AC voltage. The motor shall be of the high starting torque, continuous duty, and industrial type, protected against overload by either a thermal or current sensing overload device.

Pit Cover:

Pit Cover assembly shall be 0.010 inch thick roll-up type with continuous stainless steel surface, yellow non-skid tape, fabricated with 1/8 inch x 1/2 inch steel bars riveted to an elastomer-coated fabric. Cover to be rated for a 300-pound concentrated load at any point.

The pit cover shall have 3/4 inch x 3/4 inch x 1/8 inch wall Aluminum Tubes equally spaced on 1-3/4 inch centerlines with 1 inch nylon wheels mounted on every other tube at the ends. The pit cover shall be controlled by proximity type limit switch and safety reversing edge. All wires for safety reversing edge shall be protected by chain cable carrier.

MISCELLANEOUS COMPONENTS

Limit Switches: Limit switches shall be shall be NEMA 4 capacitive proximity limit switches rated for harsh duty. Switch housing shall be one-piece and shall be corrosion resistant stainless steel. Two switches per unit, one at entry of cover into canister housing and one at end of travel.

Audible / Strove Light Alarm: Audible/ Strove light alarm shall be a combination strove light & alarm type. Alarm shall have a red polycarbonate lens, 85 dB horn @ 8 feet, 360 degree light pattern, 65 flashes per minute, 120V.

PART 3 - EXECUTION

INSTALLATION

The operator shall be installed rigidly and securely as recommended by the manufacturer.

The pit cover system shall be installed in accordance with manufacturer's instructions and as shown on working drawings.

FIELD QUALITY CONTROL

Final adjustments of the pit cover system shall be performed in such a manner that the systems will operate as specified.

The Contractor shall replace or revise any equipment, systems or work found deficient during tests.

All control devices which are pertinent to the pit cover system, shall be set and adjusted to the satisfaction of the engineer. All operator work shall be done in collaboration with the operator manufacturer's representative.

PROJECT COMPLETION TESTS

The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

TESTING

All tests, including general performance tests to demonstrate the proper operation of the pit cover system, shall be performed by the Contractor in the presence of the operator manufacturer and the Engineer for a sufficient period of time to show that the system is operating properly.

The Contractor shall demonstrate that the pit cover system works as design, and shall be tested for proper operation of the safety reverse sensors, audible and light components.

12-11.07 REVERSE OSMOSIS FILTRATION SYSTEM AND WATER SOFTENER

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing water softener and reverse osmosis systems in conformance with the details shown on the plans and these special provisions.

The water softener and reverse osmosis system shall include all equipment, pumps, and accessories necessary for the complete installation and operation of the water treatment system.

Related Work: Piping connections shall be as specified in "Pipe, Valves, and Fittings," in Section 12-15, "Mechanical," of these special provisions.

PERFORMANCE REQUIREMENTS

Water quality for the Reverse Osmosis System(s) are as follows:

Reverse Osmosis System performance shall meet or exceed California Code of Regulations (CCR), Title 22, Chapter 15, Primary and Secondary Maximum Contaminant Levels for Drinking Water Standards.

The performance of the reverse osmosis system shall meet or exceed 97% removal of all dissolved solids and 95% removal of organic compounds, biological and colloidal suspended matter, and tubidity.

SUBMITTALS

Working Drawings: Working drawings showing complete mounting and restraint systems shall be included in submittals.

Product Data: A complete product data material list, including catalog cuts and descriptive data showing the name of manufacturer, catalog number, size, capacity, finish, and all pertinent performance ratings shall be submitted. Any performance data of the same system installed and operating in California, provide references, water quality analysis and health effects testing showing compliance with California Department of Public Health Drinking Water Treatment Components and in accordance with the CCR. Performance calculations and performance rating of the system submittal shall be completed and performed using the newly developed water well water quality analysis. The associated identification symbols used on the plans and in the special provisions for each item shall also be included.

Manufacturer's warranties and guarantees for equipment and materials installed in the work shall be delivered to the Engineer at the jobsite.

Operation and Maintenance Manuals: Prior to completion of the project, 3 bound, identical copies of the operation and maintenance instructions and parts lists for each piece of equipment furnished, shall be delivered to the Engineer at the jobsite. The operation and maintenance manuals shall include all activities and documentation necessary to comply with the warranties and guarantees for the equipment and materials installed. The warranty and guarantee dates of execution and expiration, shall be marked on the manuals and the duration of each activity and all documentation shall be defined. Manuals that are inadequate or incomplete will be returned and the Contractor shall resubmit adequate and complete manuals. Manuals shall be provided for the following equipment:

Skid Mounted Reverse Osmosis System
Water Softener with Sediment Prefilter

QUALITY ASSURANCE

Codes and Standards: This work shall conform to the applicable portions of the CPC, California Code of Regulations, Title 24, Part 5, California Code of Regulations, Title 17 and Title 22.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

SITE CONDITIONS

Water Quality: Expected incoming water analysis are as follows:

1. Bicarbonate Alkalinity: 160210 mg/L.
2. Arsenic: 3 ug/L.
3. Calcium: 7133 mg/L.
4. Chloride: 64069 mg/L.
5. Color: Unknown units.
6. Hydrogen-Ion Concentration: 7.9 pH.
7. Total Hardness (as CaCO3): 250180 mg/L.
8. Sulfate: 426 mg/L.
9. Iron: 0.03Non-Detect umg/L.
10. Lead: Unknown
11. Magnesium: 22 mg/L.
12. Manganese: Non-Detect ug/L.
13. Sodium: 40059 mg/L.
14. Total Dissolved Solids: 1460380 mg/L.
15. Turbidity: Unknown NTU.
16. Total Alkalinity: 1370 mg/L.
17. Hydroxide: Non-Detect
18. Bicarbonate: 160200 mg/L.
18. Nitrate-Nitrogen: 2.53 mg/L.
19. pH: 7.69 units.
20. Specific Conductance: 2530660 umho/cm
21. Zinc: 0.01 mg/L

Copper is non-detect.

The expected incoming water analysis is estimated utilizing water analysis conducted at near-by wells located at Primm Valley Golf Course and a report prepared for the San Bernadino County Planning Department, California, "Ground-Water Monitoring Annual Report, July 2000-July 2001, Primm Valley Golf Club, PRMA Land Development Company, Ivanpah Valley, California," August 2001. A copy of these documents are available on the California, Department of Tansportation, Water and Wastewater Engineering Branch website at

http://www.dot.ca.gov/hq/esc/sdsee/wwe/water_wastewater.html

The inlet water pressure ranges from 40-60 psig.

MAINTENANCE

Maintenance Instructions: Prior to completion of the project, one set of maintenance instructions for each pump including the pump curve, shall be encased between two heat-fused laminated plastic sheets, and shall be attached near each pump at a convenient location approved by the Engineer.

PART 2 - PRODUCTS

Reverse Osmosis System:

The reverse osmosis system shall be a skid mounted packaged unit, 2,000 gallons per day, 5 micron polypropylene depth type filter, 10 micron carbon block filter, reverse osmosis thin film composite membrane and a repressurizing pump. An auto flush timer shall regulate the product to waste ratio and back flushing.

The housing shall be corrosion resistant; designed to separate feedwater from filtrate and to direct feedwater through water filter element(s); with element support(s) and brackets. Attach supports and brackets to housing with reinforcement strong enough to resist filter movement during a seismic event. The unit shall have a ball valve inlet, and threaded connections.

Components included in reverse osmosis system: Monitoring panel, Brine control valve, Concentrate recirculation valve, pH adjustment component, Prefilter in/out pressure gauges (stainless steel case, bronze internals, glycerin filled), Reverse Osmosis vessel in/out pressure gauges (stainless steel case, bronze internals, glycerin filled), Pressure relief valve, Product flow meter, Brine flow meter, Recirculation flow meter, Total Dissolved Solids monitor, pH in/out monitor, Conductivity monitor.

Control Panel: The control panel shall include a program logic controller, electrical connections. The features shall include monitors feed water supply pressure for minimum level, product water storage tank level for system start/stop, product water conductivity for maximum set point value and digital front panel display, main pump high pressure set point, low feed water level and membrane flush cycle, occurrence and duration. Front Panel display allows for operator adjustment of set points and flush parameters. For float level control settings see plans.

The skid shall be corrosion resistant, designed to house the reverse osmosis system and control panel. The skid shall include mounting hardware to secure the unit in place and have the capacity to withstand siesmic events. Restraints for building equipment shall comply with the California Building Code.

Water Softener: Water softener shall be salt-based, microprocessor-controlled, twin mineral tank and brine tank packaged unit, NSF 61 certified, and have a 5 micron sediment prefilter. The softener shall treat the water at minimum flow of 16 gpm and maximum flow of 20 gpm. The unit shall treat for a hardness value of 9 grains per gallon (gpg) minimum. All fittings and valves shall be included for complete installation. The packaged unit shall include restraints capable of withstanding seismic events in compliance with the California Building Code.

VALVES

Valves shall be the same size as the pipeline which the valves serve, unless otherwise noted on the plans.

Sampling Valve: Sampling valve shall be ½-inch, brass or bronze, rated at 100 psi minimum, with lever handle and bib nose outlet without threads.

Check Valve (1½-inch and smaller): Check valve (1½-inch and smaller) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed.

Check Valve (2-inch and larger): Check valve (2-inch and larger) shall be silent wafer type, full faced for installation between 125 psi flanges, iron body with bronze trim, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed.

PART 3 - EXECUTION

INSTALLATION

INSTALLATION OF PIPES AND FITTINGS

Pipe and Fittings: Pipe and fittings shall be installed in accordance with Section 12-15.

TESTING

Testing of all piping shall be in accordance with Section 12-15.

Sampling and Testing:

After the disinfection, flushing and bacteriological testing and sampling procedure of the distribution system is completed and before the facility is placed into service, the contractor shall sample the treated water for water quality. The Contractor shall sample the constituents as required by the California Code of Regulations (CCR), Title 22, Chapter 15, Primary and Secondary Maximum Contaminant Levels for Drinking Water Standards. The samples shall be sent to a State certified laboratory for analysis and shall be absent of coliform organisms and meets or exceeds the performance requirements.

The Contractor shall also sample the water for water quality and performance requirements after each water softener unit. The test method to analyze for total dissolved solids shall be the approved Standard Methods Committee, 2540C or US EPA Gravimetric Method 8163. A copy of all results shall be sent directly to the Engineer by the testing laboratory.

If the laboratory results fail to produce satisfactory bacteriological results, the disinfection procedure shall be repeated until a satisfactory result is obtained. If the laboratory results fail to meet the performance requirements, the Contractor shall replace the unit, component and/or filters and repeat the sampling until the results meet the performance requirements.

Samples of water shall be obtained from each of the following locations for the initial test and any subsequent testing:

1. Well head
2. After the pressure tank (at well)
3. Sink in each building (not a service sink)
4. Before and after water softener
5. After the reverse osmosis system
6. After the storage tank
7. After the pressure tank

OPERATIONAL TEST

The water supply system shall be operated and checked by the Contractor for a period of at least 3 consecutive 8-hour days to demonstrate the satisfactory overall operation of the water supply system as a completed unit. The test shall be conducted in the presence of the Engineer. During the test period, final adjustments shall be made to the equipment and components as required to place the system in satisfactory operating condition.

Any equipment, systems, or work found deficient during the test shall be replaced or repaired and retested. The Engineer shall be notified at least 72 hours in advance of starting the initial test and any retesting.

12-11.08 CLARIFIER TANK

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a precast concrete clarifier tank in accordance with the details shown on the plans and these special provisions.

Pipes, fittings, devices, aprons, appurtenances, and other items or details, not mentioned, which are required for the construction and proper operation of the clarifier shall be furnished, placed, constructed, or installed as required.

Pipes, fittings and similar equipment shall conform to the applicable requirements in "Sanitary Sewer Disposal System," in Section 12-2 of these special provisions.

SUBMITTALS

Materials List:

Material list for material to be used shall be submitted for approval and shall include the name of the manufacturer and the source, model number, description, and standards of manufacturer.

Manufacturer's descriptive data and catalog cuts for manhole frames and covers, traffic frames and covers, and traffic frames and grates shall be submitted for approval.

Working Drawings: Working drawings and design calculations for the precast concrete tank used in the work shall be submitted for approval. The drawings and calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. Bedding, assembly, installation and backfilling instructions for the precast tank shall be submitted for approval.

QUALITY ASSURANCE

Certificates of Compliance: Certificates of compliance shall be furnished for manhole covers and frames, traffic covers and frames and traffic grates and frames in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2 - PRODUCTS

MANUFACTURED UNITS

Precast Tank:

Clarifier tank shall be precast, reinforced concrete tank of the size shown on the plan. The design and details shall comply with the minimum requirements of the American Concrete Institute (ACI) 318 Code. Minimum concrete compressive strength (f'c) shall be 3,000 psi. Tanks shall be designed for all loads and pressures resulting from the vertical and lateral earth loadings listed below:

1. Minimum earth cover over the tanks as shown on the plans.
2. Earth density: 120 pounds per cubic foot.
3. Equivalent fluid pressure for lateral pressure due to earth: 30 pounds per square foot per foot.

Clarifier tank shall be Nottingham, Cook Concrete Products (Redding), Bakersfield Precast Concrete, or equal.

ACCESSORIES

Cast-in-place Concrete and Reinforcement: Cast-in-place concrete and reinforcement for collars shall conform to the requirements for minor work specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

Cement Mortar: Cement mortar shall consist of one part cement to 2 to 3 parts clean plaster or concrete sand mixed with just enough water for suitable consistency.

Epoxy Mortar: Epoxy mortar shall be commercial quality, low viscosity paste polysulfide extended epoxy formulated primarily for use in bonding new portland cement concrete to old portland cement concrete.

Pea Gravel Backfill: Pea gravel for precast concrete tank backfill shall be clean aggregate, free from clay or organic material and graded such that 90 percent to 100 percent passes the No. 4 sieve size.

Backfill: Backfill, unless otherwise shown on the plans, shall be native material, free of rocks greater than 2 inches in greatest dimension, vegetable matter, trash or other deleterious material. The thickness of each layer of backfill before compaction shall not exceed 6 inches.

Sealant: Sealant for precast concrete tank shall be closed cell expanded neoprene conforming to ASTM Designation: D 1056, Grade RE 41.

Manholes: Manholes shall be precast, reinforced concrete manhole sections, conforming to ASTM Designation: C 478; or nonreinforced concrete pipe conforming to ASTM Designation: C 14; or precast reinforced concrete pipe conforming to ASTM Designation: C 76.

Manhole Frames and Covers: Manhole frames and covers shall be coal tar epoxy coated, gray cast iron, conforming to ASTM Designation: A 48, Class 30 or greater (traffic type). Cover shall be no bolt, gas tight, closed pick hole, and shall be marked "SS," "SEWER," or "SANITARY SEWER." The side or bottom of the cover shall be machine grooved for an integral O-ring gasket. The frame seat for the bottom O-ring gasket shall be a minimum of 7/8 inch in width. The machine groove may be omitted and a flat gasket may be used, provided that the gasket is molded to the frame seat with contact cement.

Traffic Frame and Cover: Traffic frame and cover shall be square, heavy duty type manhole with bottom flanged frame and solid cover. Frame and cover shall be asphalt coated, ductile iron castings conforming to ASTM Designation: A 536, Grade 60-40-18. Cover shall have lifting handles and 2 corrosion resistant, countersunk bolts located in opposite sides of the cover.

PART 3 - EXECUTION

INSTALLATION

Manufactured precast clarifier tank and manhole frames and covers, traffic frames and covers, traffic frames and grates, and other appurtenances shall be installed in accordance with the manufacturer's recommendations and the approved working drawings.

FIELD QUALITY CONTROL

Testing: The clarifier tank shall be tested for leakage by filling the tank with water to the level of the outflow line for a period of 24 hours. All seams and joints shall be left exposed (except the bottom of the tank) for inspection purposes. The tank shall remain watertight. Repairs, if necessary, shall be made at the Contractor's expense.

12-11.09 WORKBENCH

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a workbench in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product data: Manufacturer's descriptive data and standard color palette shall be submitted for approval.

PART 2 - PRODUCTS

Workbench: Workbench shall be standard, factory fabricated and factory painted heavy duty workbench unit with plywood reinforced steel top, drawers, curb and shelves. Plywood top reinforcement shall consist of two layers of securely fastened ¾-inch thick exterior type plywood. The drawers, shelves and curb shall be as shown on the plans. Paint shall be an industrial grade enamel.

Leg anchors: Leg anchors shall be ICC approved, integral stud type expansion anchors or internally threaded type anchors with independent stud.

PART 3 - EXECUTION

Installation:

The workbench shall be installed with the top level and the legs rigidly and securely fastened to the floor.

Anchors for the legs shall be installed in accordance with the manufacturer's instructions.

SECTION 12-12. FURNISHINGS

12-12.01 HORIZONTAL BLINDS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing horizontal blinds in accordance with the details shown on the plans and these special provisions.

Horizontal blinds shall be standard, factory manufactured assemblies suitable for use on exterior wall windows.

SUBMITTALS

Product Data: Manufacturer's descriptive data, color chips, and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Horizontal Blinds:

Horizontal blinds shall be nominal one inch wide, spring tempered virgin aluminum alloy horizontal slats supported by braided polyester ladders. Braided ladders shall hold slats at equal spaces, parallel, straight, and shall provide tilt control and adequate overlap of slats. The distance between ladders shall not exceed

23 inches. Slat tilt shall be adjustable by a transparent wand. Blinds shall be adjustable to any height using lift cords.

Hardware shall be enclosed in a metal head and the opening hardware shall be clinched to the head. All metal parts shall have a corrosion resistant coating.

PART 3 - EXECUTION

INSTALLATION

Horizontal blinds shall be installed in accordance with the manufacturer's instructions.

12-12.02 AUDIO-VISUAL VENETIAN BLINDS

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing audio-visual venetian blinds in accordance with the details shown on the plans and these special provisions.

Audio-visual venetian blinds shall be standard, factory manufactured assemblies suitable for use on exterior wall windows in audio-visual type meeting rooms.

SUBMITTALS

Product Data: Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PART 2 - PRODUCTS

Venetian Blinds:

Venetian blinds shall be nominal 2 inches wide, spring tempered aluminum horizontal slats supported by braided polyester ladders. Slats shall have rout holes and rear notches for effective light sealing. Braided ladders shall hold slats at equal spaces, parallel, straight, and shall provide tilt control and adequate overlap of slats for effective light sealing. The distance between ladders shall not exceed 36 inches. Slat tilt shall be adjustable by a transparent wand. Blinds shall be adjustable to any height using lift cords. Blinds shall be provided with light traps at the head, jambs and sills.

Hardware shall be enclosed in a metal head and the operating hardware shall be clinched to the head. All metal parts shall have a corrosion resistant coating.

PART 3 - EXECUTION

INSTALLATION

Venetian blinds shall be installed in accordance with the manufacturer's recommendations.

The completed installation shall provide a light shield without excessive light leaks.

SECTION 12-13. SPECIAL CONSTRUCTION

12-13.01 FIBERGLASS REINFORCED PLASTIC BUILDINGS

PART 1 - GENERAL

SUMMARY

Freestanding, shop fabricated fiberglass reinforced plastic (FRP) composite building.

Include fasteners, anchors, doors and frames, vents, windows, gasketing, lighting.

SYSTEM DESCRIPTION

Design Requirements:

Buildings shall conform to dimensions shown on drawings.

Buildings shall be completely waterproof, air and watertight, corrosion and chemical resistant, lightweight, and environmentally aesthetic.

Design to sustain superimposed loads for load combinations in accordance with ASCE 7-05.

Buildings shall conform to the requirements of the 2007 CBC

SUMITTALS

Product Data: Resin and glass manufacturers material specifications.

Working Drawings:

Include plans and elevations, fabrication details indicating laminate thickness and section depths widths, location of openings and equipment supports, size and location of anchor bolts, and gasketing details.

Structural calculations sealed by professional engineer registered in State of California.

QUALITY ASSURANCE

Buildings provided shall be end product of one manufacturer to achieve standardization for appearance.

Manufacturer Qualifications: Building shall be manufactured and erected by firm with minimum of 5 years experience in structures of sizes and character specified.

DELIVERY, STORAGE, AND HANDLING

Store and protect on manufacturer's site, project site and during shipment and installation to prevent warping and fracturing.

Shrink-wrap the building components with protective plastic for shipment and storage at the job site.

PART 2 - PRODUCTS

LAMINATE MATERIALS

Resins: Resins used shall be orthophthalic polyesters. Fillers and additives may be used to achieve chemical resistance and fire retardant properties specified. Resins shall be suitable for service in temperature from -30 degree F to +140 degree F.

Gel coat: Isophthalic NPG, UV-stable, chalk resistant, high gloss, color as selected by the Engineer.

Insulation: Two inch thick ridged polyisocyanurate urethane foam system designed for permanent thermal insulation properties at temperature ranges of -300 to +300 degrees F.

Fiberglass Reinforced Plastic (FRP) composition:

Building Panels: Wall and roof panels shall be high gloss molded of the following composition:

FRP laminate, 3/16" thick, consisting of 18 mils minimum isophthanlic NPG exterior gel coat, 1 1/4" random fiber - chopped roving (minimum glass content to be 35% by weight), and polyester structural laminating resin sandwiching a solid polyisocyanurate urthane insulation core molded to the desired structural and architectural shape.

Panel Flanges: Minimum 1/4". FRP laminate.

Perimeter Anchoring Flanges: The anchoring flanges shall be minimum 1/4" thick FRP laminates. In addition one layer of stitch mat shall be used. The stitch mat shall be laminated within the anchoring flange.

Physical Properties: Fiberglass reinforced plastic shall have minimum Barcol Hardness of 35.

MISCELLANEOUS MATERIALS

Concrete Anchors: Anchor bolts shall be minimum 3/8" diameter stainless steel conforming to ASTM A307, with oversized stainless steel plate washers to prevent localized stressing of the base flange.

Building Panel Connections: Stainless steel hex bolts, flat wasfers, and hex nuts of size as determined by manufacturer's structural analysis, minimum 5/16".

Metals: Any structural steel used on composite FRP structure shall conform to ASTM A36.

Doors: Door and frames shall be industrial grade aluminum frame construction, double panel 6068, insulated between two FRP door panel skins. Hardware shall be heavy-duty stainless steel. Provide 4 1/2" x 4 1/2" triple butt hinges, pneumatic closure/hold open devices, top and bottom bolts on inactive leaf, complete weatherstripping, threshold and header seals, and drip edge. Provide commercial lockset.

PART 3 - EXECUTION

EXAMINATION

Examine surface to receive building for acceptable installation conditions. Do not start installation unless acceptable conditions are provided.

INSTALLATION

Install in accordance with manufacturer's instructions and approved submittals,

Use washers to avoid localized stresses.

Seal exterior edges of adjacent panels with color match silicon sealant.

Minimum spacing and edge distance of concrete anchors shall conform to requirements of ASTM A307.

12-13.02 PRE-ENGINEERED CONCRETE BUILDING

GENERAL

This work shall consist of designing, fabricating, furnishing and erecting a pre-engineered concrete building in conformance with the details shown on the plans and these special provisions.

The pre-engineered concrete building shall provide a totally integrated weatherproof unit and shall include concrete floor, wall, and roof panels, high strength bolts, fasteners, sealants, louvers, flashing, and other such elements or components of the frame and outside walls and roof, not mentioned, which are required for the complete construction of a rigid, waterproof building.

The building dimensions shown on the plans are minimal and may be increased to accommodate manufacturer's standards. No additional compensation will be allowed for any changes required by such increased dimensions.

DESIGN CRITERIA

The building and the building design shall be in conformance with the applicable requirements in the International Building Code, including the modification to loads or stresses indicated therein.

The building shall be designed to support the weight of the building components, including mechanical equipment located on the roof, and the live load, wind load, seismic load, and the loads shown in the design notes on the plans.

The building shall be engineered to withstand any stresses caused during transportation and erection. Doors, walls, and roof panels shall be reinforced to provide a rigid module. Deflection under specified loadings shall not exceed 1/4" per 10 feet span.

Weathertight features of the design shall include closures and continuous seals at panel ends and sides, flashing and sealing.

SUBMITTALS

Complete working drawings, erection instructions and drawings and design calculations shall be submitted for approval. Submittals shall be approved prior to the start of fabrication.

Working drawings, erection drawings and design calculations shall be signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

Working drawings shall show the size, thickness, shape, configuration, type, grade, class and description if any, of all materials used in the building. Joint details, connection and anchoring details and details of all temporary and permanent supports shall be shown.

Calculations for the design of the building shall include a list of applied loads and load combinations with the resulting forces and stresses.

If the design calculations consist of computerized or tabulated calculations, the values pertaining to the building design for this project shall be identified, described or indexed in such a manner that a design check can be performed.

Proposed electrical equipment layout with conduit riser diagrams, required penetrations for conduits, and penetration sealing method shall be shown on the working drawings.

CERTIFICATES OF COMPLIANCE

Certificates of compliance shall be furnished for the pre-engineered concrete building in conformance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE AND HANDLING

The pre-engineered building shall be transported and handled in such a manner as to prevent damage. Building components shall be stored off the ground.

PRODUCTS

Wall, floor and roof panels:

Wall, floor and roof panels shall be concrete having a compressive strength of 3000 PSI in 28 days. Wall panels shall have a vertical 3/4" architectural fin.

Reinforcing steel shall conform to ASTM Designation: A 615 / A 615M, Grade 60 or ASTM Designation A706 / A706M.

Louvers: Louvers shall be as specified in Section 12-10, "Specialties," of these special provisions.

Hinged doors and frames and finish hardware: Hinged doors and frames and finish hardware shall be as specified in Section 12-8, "Doors and Windows," of these special provisions.

EXECUTION

Fabrication:

Building frame components shall have all the bolt holes necessary for erecting, assembling and fastening made at the factory.

Bolt holes shall be either punched full size, sub punched or reamed, or sub drilled and reamed. The finish holes shall be cylindrical, perpendicular to the plane of the connection, and shall be not more than 1/16" larger than the nominal diameter of the bolt. Mispunched or misdrilled holes shall not be corrected by welding unless approved in advance by the Engineer.

Framing erection:

Framing shall be erected plumb and true and shall be secured rigidly in place in conformance with the details shown on the approved working drawings.

Temporary bracing shall be installed during erection to hold the framing plumb and true and in a safe position until sufficient permanent bracing and construction is in place to provide full stability. All permanent bracing shall be secured in place before any sustained permanent loads are applied to the framing system. Bracing shall be positioned to clear electrical work and openings for accessories.

Openings for accessories shall be plumb and level, of the correct dimensions, located approximately where shown on the plans, and reinforced to support the loads of the accessories.

Cutting, welding, or altering of the framing members at the site shall not be allowed without prior written approval of the Engineer.

Roof, floor, and wall panel installation:

Roof, floor and wall panels shall be installed in conformance with the details shown on the approved working drawings.

Panels shall be adjusted to final position and brought to bear on the structural support prior to fastening. Side laps shall be as recommended by the building manufacturer and shall be located over structural supports.

Closures shall be installed and sealant shall be applied as recommended by the manufacturer to prevent weather penetration.

Vents and louvers shall be installed with the roof and wall panels and shall be weather tight.

The completed installation shall be without defacements, bends, sags, dimples, undulations, or other deformations; shall be free of vibrations, rattles and noise due to wind or thermal movement; and shall be weather tight.

Sealing joints:

Joints shall be sealed as shown on the plans.

Sealant shall be applied in conformance with the manufacturer's recommendations. Applications shall be a continuous operation for the length of the joint.

Following the application of the sealant, the joint shall be tooled using a tool similar to that used to produce concave masonry joints. The joint shall remain undisturbed after tooling for not less than 48 hours.

Sealing conduit penetrations: Penetrations for conduits shall be permanently grout filled and sealed weather tight after installation of the conduits.

SECTION 12-14. (BLANK)

SECTION 12-15. MECHANICAL

12-15.01 MECHANICAL WORK

PART 1 - GENERAL

Scope: This work shall consist of performing mechanical work in accordance with the details shown on the plans and these special provisions.

Mechanical work shall include furnishing all labor, materials, equipment and services required for providing heating, ventilating, air conditioning, plumbing and liquefied petroleum gas (LPG) distribution systems.

Earthwork, foundations, sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work shall be in accordance with the requirements specified for similar type work elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of pipes, ducts, etc., and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

Roof penetrations shall be flashed and sealed watertight in accordance with the requirements specified under "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS

Product Data:

A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout shall be included where applicable.

Manufacturer's descriptive data shall be submitted for the following:

Access Door
Air Conditioner (Wall Mounted)
Backflow Preventer
Balance Damper
Ball Valve
Ceiling Diffuser
Centrifugal Supply Fan
Check Valve
Cleanout through Floor
Cleanout through Wall
Cleanout to Grade
Combination Heat Lamp/Light/Fan
Combination Heating/Cooling Rooftop Unit
Compression Stop
Disposer
Electric Water Cooler
Emergency Eye Wash
Emergency Eye Wash and Shower
Evaporative Cooler
Exhaust Fan
Exhaust Fan (Declassification Fan)
Exhaust Hood
Fire Hydrant
Flexible Coupling
Flexible Ductwork
Floor Drain
Gas Valve
Gate Valve
Heat Pump (Ductless)
Hose Faucet
Inline Circulator Pump
Insulating Union
Kitchen Sink
Lavatory
Mop Sink
Outdoor Condensing Unit
Piping
Pressure Gage
Radiant Heater
Range Hood
Return Register
Rigid Ductwork
Roof Exhaust Hood
Service Sink
Spiral Duct
Split System Air Conditioner s/Gas Furnace
Sump Pump
Supply Diffuser
Thermostat
Time Switch
Trap Primer

Unit Heater
Urinal
Valve Box
Volume Damper
Water Chiller
Water Closet
Water Hammer Arrestor
Water Heater (LPG)
Wheelchair Accessible Shower Unit

CLOSEOUT SUBMITTALS

Operation and Maintenance Manuals:

Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals shall be submitted for the following equipment:

Centrifugal Supply Fan
Ceiling Exhaust Fan
Combination Heat Lamp/Light/Fan
Combination Heating/Cooling Rooftop Unit
Electric Water Cooler
Exhaust Fan
Exhaust Fan (Declassification Fan)
Exhaust Hood
Heat Pump (Ductless)
Inline Circulator Pump
Split System Air Conditioner w/Gas Furnace
Thermostat
Time Switch
Unit Heater
Water Chiller
Water Heater (LPG)

QUALITY ASSURANCE

Codes and Standards: Mechanical work, including equipment, materials and installation, shall conform to the CBC,CMC, and to the California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

WARRANTY

Warranties and Guarantees: Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

SYSTEM IDENTIFICATION

Piping, Ducts, Valves and Equipment:

Identification of piping, ducts, valves and equipment shall be as shown on the plans or these special provisions:

Above Ground Piping and Ducts: Markers shall be provided on lines which are either exposed or concealed in accessible spaces. For piping systems, except drain and vent lines, indicate the fluid

conveyed or its abbreviation; either by preprinted markers or stenciled markings, and include arrows to show the direction of flow. Colors shall comply with ANSI Standard: A13.1. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through penetrations in floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50-foot maximum intervals along exposed portions of the lines. Marking of short branches and repetitive branches for equipment connections is not required.

Valves: Valve tags shall be provided on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Provide brass or plastic laminate tags. Prepare and submit a tagged valve schedule, listing each valve by tag number, location and piping service. Valve schedule shall be mounted in a glazed frame at a location approved by the Engineer.

Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate, which bears the unit mark number as indicated on the drawings (for example, AC-4). Provide ½-inch high lettering, white on black background. Nameplates shall be permanently secured to the unit.

PART 2 – PRODUCTS (Not applicable)

PART 3 – EXECUTION (Not applicable)

12-15.02 PIPE, FITTINGS AND VALVES

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing pipes, fittings and valves in accordance with the details shown on the plans and these special provisions. Pipe, fittings and valves shall include such plumbing and piping accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the plumbing and piping systems.

All piping insulation and wrapping material shall be in accordance with the requirements specified under "Mechanical Insulation," in this Section 12-15.

Cathodic protection for underground piping shall be in accordance with the requirements specified under "Cathodic Protection," in this Section 12-15.

The pipe sizes shown on the plans are nominal inside diameter. No change in the pipe size shown on the plans shall be permitted without written permission from the Engineer.

The pipe and fitting classes and material descriptions shall be as specified herein. No change in class or description shall be permitted without written permission from the Engineer.

QUALITY ASSURANCE

Codes and Standards: Pipe, fittings and valves shall be installed in accordance with the requirements in the CPC, the manufacturer's recommendations and the requirements specified herein.

PART 2 - PRODUCTS

MATERIALS

PIPE AND FITTINGS (Class and Description)

A1: Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with 150 psi galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

A2: Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, may be used. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

A3: Schedule 5 steel pipe conforming to ASTM Designation: A 135 with pressfit fittings and couplings for service as designated.

A4: Pipe and fittings shall be UL or FM listed, ferrous (Schedule 20 minimum) or copper (Type L minimum), suitable for the working pressure involved but not less than 175 psi. Pipe and fittings shall be in accordance with National Fire Protection Association (NFPA 13-2002) Code requirements.

B1: Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with screwed fittings suitable for working pressure involved, but not less than 175 psi. Fittings shall be listed for fire protection.

B2:

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with 150 psi black malleable iron banded screwed fittings and black steel couplings.

Steel pipe coating, where required, shall be factory applied plastic. Pipe coating shall be Standard Pipe Protection, X-Tru-Coat (20-mil thickness); Pipe Line Service Corporation, Republic; 3M Company, Scotchkote 205 (12-mil thickness); or equal.

B3: Schedule 80 black steel pipe conforming to ASTM Designation: A 53 grade B, pipe 2 inches in diameter and smaller shall have 3,000 psi WOG socket welding fittings and couplings or 2,000 psi WOG threaded forged steel, ASTM Designation: A 105. Pipe 2½ inches in diameter and larger shall be extra strong weight butt welding fittings and couplings.

C1: Hub and plain end cast iron soil pipe with neoprene gaskets conforming to Cast Iron Soil Pipe Institute's Standard 301. Pipe, fittings and gaskets shall be of one manufacturer.

C2: Hubless cast iron soil pipe with neoprene gaskets, corrugated stainless steel shields and stainless steel clamps conforming to Cast Iron Soil Pipe Institute's Standard 301. Joint materials shall be furnished by pipe manufacturer.

D1: Ductile iron push on joint pipe conforming to AWWA Designation: C151. Fittings shall be push on ductile iron conforming to AWWA Designation: C153. Joints shall be rubber gasketed and designed for a working pressure of 350 psi. Pipe and fittings shall be supplied with bituminous outer coating and cement lining. Pipe shall be listed for fire protection.

H1: Type DWV hard copper tubing conforming to ASTM Designation: B 306, with DWV drainage fittings, stop type couplings and threaded adapters.

H2: Type K hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

H3: Type L hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

P1: Polyvinyl chloride (PVC) gravity sewer plastic pipe and fittings conforming to ASTM Designation: D 3034, Standard Dimension Ratio (SDR) 35, with integral bell and bell and spigot rubber gasketed joints or conforming to ASTM Designation: D2665 with solvent welded fittings. Rubber gaskets shall conform to ASTM Designation: F 477. Stainless steel clamps with rubber boots shall not be used.

P2: Polyvinyl chloride (PVC) plastic pipe and fittings conforming to ASTM Designation: D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 200 psi working pressure at 73°F, National Sanitation Foundation approved. Pipe shall have bell ends conforming to ASTM Designation: D 3139 with triple edge rubber sealing ring. For pipe sizes 2-inch diameter and smaller, plain end pipe with solvent welded fittings ASTM Designation: D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 200 psi may be used.

P3: Polyvinyl chloride (PVC) standard weight pipe and fittings, Schedule 40, conforming to ASTM Designation: D 1785. Pipe shall meet or exceed requirements of National Sanitation Foundation Standard No. 14. Pipe shall have bell ends conforming to ASTM Designation: D 2672. For pipe sizes 3 inches and smaller, plain end pipe with solvent welded fittings conforming to ASTM Designation: D 2241, may be used.

P4: Polyvinyl chloride (PVC) plastic pipe and fittings shall conform to AWWA Designation: C900, Class 150, Standard Dimension Ratio (SDR) 18. Pipe shall have bell end with a solid cross section elastomeric ring conforming to ASTM Designation: D 1869. Pipe shall be listed for fire protection.

P5: Polyethylene plastic gas pipe and fittings conforming to ASTM Designation: D 1248 and D 2513 with Standard Dimension Ratio (SDR) 11, rated for 60 psi working pressure at 73°F, socket type fittings, joined by heat fusion.

P6: Polyvinyl chloride (PVC) natural gas pipe, Class 315, conforming to ASTM Designation: D 2513. Fittings shall be Schedule 40 conforming to ASTM Designation: D 2513, and shall be primed and glued. Primer shall conform to ASTM Designation: F656. Solvent cement shall conform to ASTM Designation: D2564. Approved adapters shall be used for transition to other pipe materials.

Unions (for Steel Pipe): Unions (for steel pipe) shall be 250 psi, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

Unions (for Copper or Brass Pipe): Unions (for copper or brass pipe) shall be 150 psi cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 125 psi cast brass, ground joint, brass to brass seat with threaded ends.

Unions (for Brass Waste and Flush Pipes): Unions (for brass waste and flush pipes) shall be slip or flange joint unions with soft rubber or leather gaskets. Unions shall be placed on the fixture side of the traps.

Dielectric Waterway: Dielectric waterway shall be a premanufactured unit that incorporates an insulated interior lining at least 3 inches in length between the 2 pipes being connected while maintaining metal to metal contact on the exterior surface. Dielectric water way shall be listed by IAPMO (International Association of Plumbing and Mechanical Officials).

Insulating Union: Insulating union or flange as applicable shall be suitable for the service on which used. Connections shall be constructed such that the 2 pipes being connected are completely insulated from each other with no metal to metal contact. Insulating couplings shall not be used. Insulating union shall be F. H. Maloney; Central Plastics; EPCO; or equal.

Insulating Connection (to Hot Water Tanks): Insulating connection (to hot water tanks) shall be 6-inch minimum, flexible copper tubing with dielectric union at each end and designed to withstand a pressure of 150 psi and a temperature of 200°F.

VALVES

Gate Valve (2½-inch and smaller):

Gate valve (2½-inch and smaller) shall be bronze body and trim, removable bonnet and non rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 438; Nibco Scott, T-113; Jenkins, 370; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve shall be Kitz, 59; Nibco Scott, S-113; Jenkins, 1240; or equal.

Gate Valve (3-inch and larger, above ground): Gate valve (3-inch and larger, above ground) shall be iron body with bronze trim, removable bonnet and non-rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 461; Nibco Scott, F-619; Jenkins, 326; or equal.

Gate Valve (3-inch and larger, below ground): Gate valve (3-inch and larger, below ground) shall be AWWA double disc, hub or rubber ring type, removable bonnet and non-rising stem, equipped with operating nuts, 200 psi working pressure, and Tee handle wrench for each valve. Valve shall be Mueller, A-2380; American Valve, Model 28; or equal.

Ball Valve: Ball valve shall be two piece, minimum 400 psi WOG, bronze body and chrome plated or brass ball with full size port. Valve shall be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

LPG Gas Valve: LPG gas valve shall be listed, 250 psi (minimum) WOG bronze ball valve. Valve shall be Jenkins, Model 30-A; Crane, Accesso; Watts; or equal.

Check Valve (1½-inch and smaller): Check valve (1½-inch and smaller) shall be silent spring loaded type, threaded bronze body, nylon or teflon disc, beryllium or stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be Nibco/Scott, T-480; CPV, 36; Kitz, 26; or equal.

Check Valve (2-inch and larger): Check valve (2-inch and larger) shall be silent wafer type, full faced for installation between 125 psi flanges, iron body with bronze trim, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be APCO, Series 300; CPV, 10D; Metraflex, Series 900; or equal.

Pressure Reducing Valve (PRV): Pressure reducing valve (PRV) shall be direct acting, spring loaded diaphragm type control valve with balanced single seat, bronze body, bronze trim and screwed connection. PRV shall be completely self-contained and shall require no external sending pipes or outside control medium. The outlet pressure of the PRV shall be adjustable within a range of 25 psi to 60 psi.

FAUCET AND HYDRANTS

Hose Faucet: Hose faucet shall be compression type, angle pattern, wall flange at exterior locations, tee handle, ¾-inch female thread with hose end, rough chrome or nickel plated finish for locations inside building, rough brass finish for others. Hose faucet shall be supplied with an integral or nonremovable threaded outlet vacuum breaker which meets the requirements of the American Society of Sanitary Engineering (ASSE) Standard: 1011. Hose faucet shall be Nibco, No. 63VB; Chicago, No. 13T; or equal.

Wall Hydrant:

Wall hydrant shall be ¾-inch, non-freeze type, exposed, nickel bronze head with bronze casing, and integral vacuum breaker. Operating key shall be provided. Wall hydrant shall be J. R. Smith Model 5609 QT, Josam Model 71050, Zurn, Model 1310; or equal.

Box Hydrant:

Box hydrant shall be ¾-inch, non-freeze type, nickel bronze box and hinged, locking cover, bronze casing and hydrant, integral vacuum breaker and minimum ¼-inch I.P.S. drain port. Operating key shall be

provided. Box hydrant shall be J. R. Smith, Model 5509 QT; Josam, Model 71000; Wade, Model 8625; or equal.

Wharf Hydrant:

Wharf hydrant shall be bronze, 300 psi working pressure, operating nut, lug type reducer and hose cap, and chain. Wharf hydrant shall have standard threads on inlet and National Standard Hose Threads on outlet. Lug type reducer shall have National Standard Hose Threads. Wharf hydrant shall be James Jones; Powhatan; John W. Moon Inc.; or equal.

A wharf hydrant operating nut wrench and hose spanner wrench or the combination type shall be provided for each wharf hydrant.

Fire Hydrant: Fire hydrant shall conform to the requirements of AWWA Designation: C503. Fire hydrant shall have 6-inch inlet, and have one 4-inch outlet steamer hose and two 2½-inch outlets. Fire hydrant shall be Jones, Model J-3765; Rich, Model 960; American Cast, Darling Division, Mark-73; or equal.

CLEANOUTS

Cleanout Through Wall: Cleanout through wall shall be cast iron cleanout tee type with polished stainless access plates. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

Cleanout Through Floor:

Cleanout through floor shall have nonslip scoriated nickel bronze access plate and adjustable frame with square pattern top for ceramic tile and round pattern top for other finishes. Where floors are constructed with a membrane, access frame shall be provided with membrane clamping flange. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, W-7000 Series; Smith, 4023 Series; Zurn, No. 1400; or equal.

Cleanout through floors in exterior locations shall be heavy duty, floating pipe type with cast iron cover. Cleanouts shall be Wade, No. W-8300-HF; Smith, No. 4253; Zurn, No. 1474; or equal.

Cleanout to Grade: Cleanout to grade shall be cast iron ferrule type. Plug shall be countersunk brass or bronze with tapered threads. Cleanout to grade shall be Wade, No. W-8450; Smith, 4420; Zurn, No 1440; or equal.

MISCELLANEOUS ITEMS

Water Hammer Arrestor: Water hammer arrestor shall be stainless steel body with bellows or piston. Arrestor compression chambers shall be pneumatically charged. Water hammer arrestors shall be tested and certified in accordance with the Plumbing and Drainage Institute Standard: PDI-WH201 and sized as shown on the plans.

Access Door: Access door shall be 16-gage prime coated steel, face mounting square frame, minimum 12" x 12" door with concealed hinge and screwdriver latch.

Compression Stop (Exposed): Compression stop (exposed) shall be metal full free waterway, angle type, ground joint union, non-rising stem, molded rubber seat and wheel handle.

Compression Stop (Concealed): Compression stop (concealed) shall be long neck, built-in compression stops for required wall thickness, loose key and exposed parts polished chromium plated. Supplies shall be Chicago, 1771; California Brass, No. 172; or equal.

Gas Regulator: Gas regulator shall be listed as suitable for gas and equipped with full capacity relief valve, low pressure safety shut-off and weatherproof and insect proof vent for outside installation. Capacity shall be as shown on the plans. Gas regulator shall be Fisher; Reliance; Rockwell; or equal.

Wye Strainer: Wye strainer shall be wye pattern, cast iron body and Type 304 stainless steel or monel strainer screen. The strainer screen shall have an open area equal to at least 3 times the cross sectional area of the pipe in which it is installed and shall be woven wire fabric with 20 mesh or perforated sheet with 0.032-inch maximum diameter holes.

Backflow Preventer: Backflow preventer shall be factory assembled with 2 check valves, one pressure differential relief valve, 2 ball valves and 4 test cocks. Backflow preventers shall be of the approved type reduced pressure principle devices listed by the County of Los Angeles Department of Health Services, Cross-Connection and Water Pollution Control Section, 2525 Corporate Place, Monterey Park, California 91754, Telephone (213) 881-4140.

Pipe Hanger (for piping supported from overhead): Pipe hanger (for piping supported from overhead) shall be Grinnell, Model 269; Super Struct, C711; or equal.

Pipe Wrapping Tape and Primer:

Pipe wrapping tape shall be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 20 mils. Wrapping tape shall be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer shall be compatible with the pipe wrapping tape used.

Floor, Wall, and Ceiling Plates: Floor, wall, and ceiling plates shall be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates shall be sized to completely cover the hole.

Valve Box: Valve box shall be precast high density concrete with polyethylene face and cast iron traffic rated cover marked "WATER," "GAS" or "CO-SS" as applicable. Extension shall be provided as required. Valve box shall be Christy, B3; Brooks Products Company, 3TL; Frazer, 3; or equal.

Roof Drain: Roof drain shall be cast iron body, with integral flashing clamp and gravel stop with seepage openings, 15-inch nominal polyethylene low profile dome, 3-inch caulk or no-hub outlet and underdeck clamp. Roof drain shall be J. R. Smith, 1010; Zurn, Z-100; Wade, W-3500; or equal.

Floor Drain: Floor drain shall be cast iron body and flashing collar, adjustable nickel bronze 6-inch strainer head with seepage openings and caulk or no-hub outlet. Floor drain shall be round or square as shown on the Architectural plans. Floor drain shall be J. R. Smith, 2005/2010; Wade, W-1100; Zurn, Z-415; or equal.

Trench Drain:

Trench drain shall be manufactured, pre-sloped drain system, including molded fiberglass reinforced resin channels, support brackets, heavy duty steel frames and cast-iron slotted grates. Channels shall be provided in minimum 3-foot nominal modules with outlets, end caps, and connectors. Grates shall have bolted anchorage assemblies.

Trench drain modules shall have a minimum slope of 0.60 percent and minimum flow rate of 75 GPM. Trench drain shall be Advanced Building Technologies, Inc., Polydrain; Zurn, Flo Thru; or equal.

PART 3 - EXECUTION

INSTALLATION

INSTALLATION OF PIPES AND FITTINGS

Pipe and Fittings: Pipe and fittings shall be installed in accordance with the following designated uses:

Designated Use	Pipe and Fitting Class
Domestic water (CW and HW) in buildings	H3 or A1
Domestic water underground within 5 feet of the building	A1 or H2
Domestic water underground 5 feet beyond the building	P2, P3, P4, A1 or H2
Fire protection water, underground	B1,D1 or P4
Fire protection water riser	B1, D1 or H3
Fire protection sprinkler piping in building	A1, A3, A4 or B1
Sanitary drain piping above ground in building	H1, C1, or C2
Sanitary drain and vent piping underground within 5 feet of the building	C1 or C2
Sanitary vent piping above ground in building	A2, H1, C1, or C2
Sanitary drain pipe, 5 feet beyond the building	C1, C2, or P1
Liquefied petroleum gas (LPG), 125 psi or less, above ground	A1 or B2
LPG, 125 psi or less, underground	B2 (plastic coated)
LPG, exceeding 125 psi	B3
Compressed air	A1
Scale pit sump pump piping (inside pit and through wall)	A1
Scale pit sump pump piping (outside pit wall)	P3
Undertruck lighting exhaust	C1, C2, P1
Rainwater leaders	A2
Equipment drains and relief valve discharge	H3 or A1
Soap lines	H3

Installing Piping:

Water piping shall be installed generally level, free of traps and bends, and arranged to conform to the building requirements.

Vitrified clay pipe shall be installed in accordance with ASTM Designation: C 12, Class C.

Piping installed underground shall be tested as specified elsewhere in these special provisions before backfilling.

Public use areas, offices, rest rooms, locker rooms, crew rooms, training rooms, storage rooms in office areas, hallway type rooms, and similar type use areas shall have concealed piping.

Warehouse rooms, equipment bays, and loft areas shall have exposed piping.

Piping shall not be run in floor fill, except as shown on the plans.

Piping shall be installed parallel to walls. All obstructions shall be cleared, headroom preserved and openings and passageways kept clear whether shown or not. Piping shall not interfere with other work.

Where pipes pass through exterior walls, a clear space around pipe shall be provided. Space shall be caulked water tight with silicone caulk.

Underground copper pipe shall have brazed joints. Underground plastic pipe shall be buried with No. 14 solid bare copper wire. Wire ends at pipe ends shall be brought up 8 inches and looped around pipe.

Exposed supply and drain piping in rest rooms shall be chrome finished.

Piping and tubing for hydronic heating shall be installed in accordance with the requirements specified under "Hydronic Heating System," elsewhere in this Section 12-15.

Compressed air piping shall be pitched to low point. Ball valved drips shall be provided at all low points. Branches shall be taken off top of main.

Gas piping shall not be installed under building concrete slabs or structure. An insulating connection and valve shall be installed above ground at each building supply.

Gas piping shall be pitched to equipment or to low point and provided with an 8-inch minimum dirt leg.

Plastic pipe used for natural gas shall be below grade outside of building only. Transition to Class B2 plastic coated shall be before meter, regulator, or building wall with approved metal to plastic transition fitting. PVC natural gas pipe shall be installed in accordance with International Association of Plumbing and Mechanical Officials (IAPMO) Standard: IS10.

Forty-five degree bends shall be used where offsets are required in venting. Vent pipe headers shall be sloped to eliminate any water or condensation.

Vent piping shall extend a minimum of 8 inches above the roof.

Horizontal sanitary sewer pipe inside buildings shall be installed on a uniform grade of not less than ¼ inch per foot unless shown otherwise on the plans.

Drainage pipe shall be run as straight as possible and shall have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends shall be used where possible. Long sweep bends and combination Wye and 1/8 bends may be used only for the connection of branch pipes to fixtures and on vertical runs of pipe.

Water pipe near sewers:

Water pipe shall not be installed below sewer pipe in the same trench or at any crossing, or below sewer pipe in parallel trenches less than 10 feet apart.

When a water pipe crosses above a sewer pipe, a vertical separation of at least 12 inches between the top of the sewer and the bottom of the water pipe shall be maintained.

When water and sewer pipe is installed in the same trench, the water pipe shall be on a solid shelf at least 12 inches above the top of the sewer pipe and 12 inches to one side.

Pipe Sleeves:

The Contractor shall provide sleeves, inserts and openings necessary for the installation of pipe, fittings and valves. Damage to surrounding surfaces shall be patched to match existing.

PVC pipe sleeves shall be provided where each pipe passes through concrete floors, footings, walls or ceilings. Inside diameter of sleeves shall be at least ¾ inch larger than outside diameter of pipe. Sleeves shall be installed to provide at least 3/8-inch space all around pipe the full depth of concrete. Space between pipes and pipe sleeves shall be caulked watertight.

Pipe Penetrations in Fire Rated Assemblies: Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping," in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Cutting Pipe: Pipe shall be cut straight and true and the ends shall be reamed to the full inside diameter of the pipe after cutting.

Damaged Pipe: Pipe that is cracked, bent or otherwise damaged shall be removed from the work.

Pipe Joints and Connections:

Joints in threaded steel pipe shall be made with teflon tape or a pipe joint compound that is nonhardening and noncorrosive, placed on the pipe and not in the fittings.

The use of thread cement or caulking on threaded joints will not be permitted. Threaded joints shall be made tight. Long screw or other packed joints will not be permitted. Any leaky joints shall be remade with new material.

Exposed polished or enameled connections to fixtures or equipment shall be made with special care, showing no tool marks or threads.

Cleaning and Closing Pipe: The interior of all pipe shall be cleaned before installation. All openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs shall remain in place until their removal is necessary for completion of the installation.

Securing Pipe: Pipe in the buildings shall be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports shall be compatible with the piping or neoprene isolators shall be used. Allowances shall be made for expansion and contraction. Steel pipe shall have hangers or supports every 10 feet. Copper pipe one inch or less in diameter smaller shall have hangers or supports every 6 feet and sizes larger than one inch shall have hangers or supports every 10 feet. Plastic pipe shall have hangers or supports every 3 feet. Cast iron soil pipe with neoprene gaskets shall be supported at each joint. Vertical pipes shall be supported with clamps or straps. Horizontal and vertical piping shall be securely supported and braced to prevent swaying, sagging or flexing of joints.

Hangers and Supports:

Hangers and supports shall be selected to withstand all conditions of loading to which the piping and associated equipment may be subjected and within the manufacturer's load ratings. Hangers and supports shall be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports shall be sized to fit the outside diameter of pipe or pipe insulation. Hangers shall be removable from around pipe and shall have provisions for vertical adjustment after erection. Turnbuckles may be used.

Materials for holding pipe in place shall be compatible with piping material.

Hanger rods shall be provided with locknuts at all threaded connections. Hanger rods shall be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
½” to 2”	3/8”
2½” to 3½”	1/2"
4” to 5”	5/8”
6”	3/4"

Wrapping and Coating Steel Pipe:

Steel pipe buried in the ground shall be wrapped or shall be plastic coated as specified herein:

1. Wrapped steel pipe shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
2. Tapes shall be tightly applied with 1/2 uniform lap, free from wrinkles and voids with approved wrapping machines and experienced operators to provide not less than 40-mil thickness.

3. Plastic coating on steel pipe shall be factory applied. Coating imperfections and damage shall be repaired to the satisfaction of the Engineer.
4. Field joints, fittings and valves for wrapped and plastic coated steel pipe shall be covered to provide continuous protection by puttying and double wrapping with 20-mil thick tape. Wrapping at joints shall extend a minimum of 6 inches over the adjacent pipe covering. Width of tape for wrapping fittings shall not exceed 2 inches. Adequate tension shall be applied so tape will conform closely to contours of fittings. Putty tape insulation compounds approved by the Engineer shall be used to fill voids and provide a smooth even surface for the application of the tape wrap.

Wrapped or coated pipe, fittings, and filed joints shall be approved by the Engineer after assembly. Piping shall be placed on temporary blocks to allow for inspection. Deficiencies shall be repaired to the satisfaction of the Engineer before backfilling or closing in.

Thrust Blocks:

Thrust blocks shall be formed by pouring concrete between pipe and trench wall. Thrust blocks shall be sized and so placed as to take all thrusts created by maximum internal water pressure.

Plastic pipe underground shall be provided with thrust blocks and clamps at changes in direction of piping, connections or branches from mains 2 inches and larger, and all capped connections.

Union: Unions shall be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions shall be located so piping can be easily disconnected for removal of equipment or tanks. Unions shall be omitted at compression stops.

Dielectric Waterway: Dielectric waterway shall be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

Insulating Union and Insulating Connection:

Insulating union and insulating connection shall be provided where shown and at the following locations:

1. In metallic water, gas and air service connections into each. Insulating connections shall be installed on the exterior of the building, above ground and after shut-off valve.
2. In water, gas and air service connections in ground at point where new metallic pipes connect to existing metallic pipes. Install valve box above insulating connection.
3. At points of connections of copper or steel water pipes to steel domestic water heaters and tanks.
4. At each end of buried ferrous pipe protected by cathodic protection.

Bonding at Insulating Connections: Interior water piping and other interior piping that may be electrically energized and are connected with insulating connections shall be bonded in accordance with the CEC. Bonding shall all be coordinated with electrical work.

Compression Stop: Each fixture, including hose faucets, shall be equipped with a compression stop installed on water supply pipes to permit repairs without shutting off water mains. Ball valves may be installed where shown on the plans or otherwise permitted by the Engineer.

INSTALLATION OF VALVES

Exterior Valves: Exterior valves located underground shall be installed in a valve box marked "Water." Extensions shall be provided as required.

INSTALLATION OF FAUCETS AND HYDRANTS

Hose Faucet and Hydrants: Faucets and hydrants shall be installed with outlets 18 inches above finished grade.

INSTALLATION OF CLEANOUTS

Cleanouts:

A concrete pad 18 inches long and 4 inches thick shall be placed across the full width of trench under cleanout Wye or 1/8 bend. Cast iron soil pipe (C1 or C2) and fittings shall be used from Wye to surface. Required clearance around cleanouts shall be maintained.

Cleanout risers outside of a building installed in a surface other than concrete shall terminate in a cleanout to grade. Cleanout to grade shall terminate in a valve box with cover marked "CO-SS." Top of box shall be set flush with finished grade. Cleanout plug shall be 4 inches below grade and shall be located in the box to provide sufficient room for rodding.

Cleanout risers installed in tile and concrete floors, including building aprons and sidewalks, shall terminate in a cleanout through floor.

INSTALLATION OF MISCELLANEOUS ITEMS

Water Hammer Arrestor: Water hammer arrestor shall be installed so that they are vertical and accessible for replacement. Water hammer arrestor shall be installed with access door when in walls or there is no access to ceiling crawl spaces. Access door location shall be where shown on the plans or as approved by the Engineer.

Gas Appliance Connection: Gas valve and flexible connector shall be provided for gas piping at each appliance. Appropriately rated gas cocks may be used in ½-inch gas pipe. Cock or valve shall be within 3 feet of the appliance.

Gas Regulator: Gas regulator shall be installed complete with dirt leg, capped test tee, union, insulating union, gas valve and fittings.

Trench Drain: Trench drain shall be installed where shown on the plans. Support brackets, leveling devices, trenching, and bedding concrete shall in accordance with the manufacturer's recommendations. Grates shall be installed flush with the finished floor, and each grate section shall be bolted to the trench drain frame.

Backflow Preventer:

Backflow preventer assembly shall include a wye strainer, backflow preventer, fittings and pipe. Assembly components shall be the same size as the pipe in which they are installed unless otherwise shown on the plans.

Backflow preventer shall be installed a minimum of 12 inches above ground and shall be the same size as the pipe in which it is installed unless otherwise shown on the plans.

Flushing Completed Systems: All completed systems shall be flushed and blown out.

Chlorination:

The Contractor shall flush and chlorinate all domestic water piping and fixtures.

Calcium hypochlorite granules or tablets, if used, shall not be applied in the dry form, but shall first be dissolved into a solution before application.

The Contractor shall take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings shall be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system shall be opened and water run to waste until a strong chlorine test is obtained. The line shall then be closed and the chlorine solution allowed to remain in the system for a minimum of 24 hours so that the line shall contain no less than 25 ppm chlorine throughout. After the retention period, the system shall be drained, flushed and refilled with fresh water.

FIELD QUALITY CONTROL

Testing:

The Contractor shall test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The Contractor shall take precautions to prevent joints from drawing while pipes and appurtenances are being tested. The Contractor shall repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

Cathodic Protection Tests: The State will conduct tests at locations where cathodic protection is required to determine compliance with the specified requirements.

General Tests:

All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test systems according to the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Sanitary sewer and vent	10-foot head	Water
Water	125 psig	Water
Gas (except P6)	100 psig	Air
Gas (P6)	50 psig	Air
Air	125 psig	Air

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

Sanitary sewers shall be cleared of obstructions before testing for leakage. The pipe shall be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug shall be moved slowly through the pipe with a tag line. The Contractor shall remove or repair any obstructions or irregularities.

Sanitary sewer pipes beyond 5 feet perpendicular to the building shall be tested for leakage for a period of not less than 4 hours by filling with water to an elevation of 4 feet above average invert of sewer or to top of manholes where less than 4 feet deep. The system shall show no visible leaks. The sewer may be tested in sections with testing water progressively passed down the sewer as feasible. Water shall be released at a rate that will not create water hammer or surge in plugged sections of sewer.

Testing Backflow Preventers:

Backflow preventers installed by the Contractor shall be tested at the completion of the supply system installation for proper operation by a certified Backflow Preventer Tester.

The tester shall hold a valid certificate as a Backflow Preventer Tester from the county in which the device to be tested is located or, if the county does not have a certification program for Backflow Preventer Testers, the tester shall have a certificate from one of the following:

Testing for proper operation shall conform to the procedures of the county in which the testing is being performed, or, if such procedures are not available in the county, such tests shall conform to the provisions in the latest edition of the Guidance Manual For Cross Connection Control Program, which is available from the California Department of Health Services, Division of Drinking Water and Environmental Management, 601 N 7th Street, P.O. Box 942732, Sacramento, CA 94234.

The Contractor shall notify the Engineer at least 5 days prior to testing backflow preventers. Such tests shall be satisfactorily completed after installation of the backflow preventer assemblies and before operation of the systems.

One copy of all test results for each backflow preventer shall be furnished to the Engineer.

Full compensation for providing the certified Backflow Preventer Tester and for testing the backflow preventers shall be considered as included in the lump sum price paid for building work and no additional compensation will be allowed therefor.

12-15.03 MECHANICAL INSULATION

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing mechanical insulation in accordance with the details shown on the plans and these special provisions.

Piping insulation shall be installed on all domestic hot water piping, above grade, in non-conditioned spaces.

Piping insulation shall be installed on all hydronic supply and return piping, above and below grade unless shown otherwise on the plans.

P-trap, hot water supply pipes and angle valves for lavatories and sinks, except in janitor closets or similar enclosed spaces, shall be insulated.

Duct insulation shall be installed on all rigid ductwork installed in concealed non-conditioned spaces.

Duct liner shall be installed in all rectangular ductwork installed in exposed non-conditioned spaces and in exterior locations. Plenum liner shall be installed in all plenums in non-conditioned spaces or in walls facing a non-conditioned space.

QUALITY ASSURANCE

Codes and Standards:

Mechanical insulation shall conform to California State Energy Commission regulations and, where applicable, shall meet American Society of Testing and Materials (ASTM) standards.

All materials shall bear the label of the Underwriters Laboratory (UL) or other approved testing laboratory indicating that the materials proposed for use conform to the required fire hazard ratings.

Pipe safety insulation shall conform to Chapter 15 of the 2007 California Plumbing Code

PART 2 - PRODUCTS

MATERIAL

All pipe insulation and wrapping material, including adhesives and jackets, located within buildings shall be certified to have a composite flame spread rating of not more than 25 and smoke development rating of not more than 450 when tested in accordance with ASTM Designation: E 84.

Duct insulation and wrapping material, including adhesives and jackets, located within buildings shall be certified to have a composite flame spread of not more than 25 and smoke development rating of not more than 50 when tested in accordance with ASTM Designation: E 84.

Domestic Water Piping Insulation: Piping insulation shall be glass fiber molded pipe insulation with factory applied jacket suitable for service temperatures up to 350°F. Covering jacket shall have pressure sealing lap adhesive joints. Pipe insulation shall have a minimum thermal resistance of R-3. Insulation and jackets shall be Owens-Corning, Fiberglass 25 with ASJ/SSL All Service Jacket; Manville, Micro-Lok 650ML with AP-T All Purpose Jacket; or equal.

Piping Insulation Cement: Insulation cement shall be Fenco, All Purpose Cement; Manville, JM375; or equal.

PVC Jacket: PCV jacket shall be rated for a service temperature of 175°F. PVC jacket shall include covers specifically designed to cover pipe fittings.

Pipe Safety Insulation: Pipe safety insulation for P-traps, hot water supply pipes and angle valves shall be molded closed cell vinyl or closed cell foam with exterior vinyl surface. Pipe safety insulation shall be configured to protect against contact. Pipe safety insulation shall be Truebro Inc., Handi Lav-guard; Plumberex Specialty Products, Handy Shield; or equal.

External Duct Insulation: External duct insulation shall be 1½ inch thick, one-pound density glass-fiber blanket type. Material and coatings shall be fire resistive and shall be approved by the State Fire Marshal. External duct insulation shall be Fiberglas, Type PF-336; Ultralite, No. 100; Pittsburgh Plate Glass, Superfine; Johns-Manville, Microlite; Silvercote, Silvercel; or equal.

Plenum and Duct Liner: Plenum and duct liner shall be one-inch minimum thickness. Material and coatings shall be fire resistive and shall be approved by the State Fire Marshal. Liner shall be Gustin-Bacon, Ultra-Liner duct insulation; Owens-Corning Fiberglas, Type CE; Gustin-Bacon, coated insulation Board No. 90-A; Owens-Corning Fiberglas 1½-pound density coated flexible duct liner; Johns-Manville, MicroBar, or 1½-pound density coated Microlite; Pittsburgh Plate Glass, Superfine 1½-pound density coated interior duct insulation; or equal.

Adhesive: Adhesive shall be non-flammable type: Benjamin Foster Company, No. 85-20 Spark Safe; Goodloe E. Moore Company, Tuff Bond No. 6; Permacel, No. PA-3l0; 3M, No. 38 Insulation Adhesive; Swift's, No. 7228 brush type or No. 7336 spray type; Chicago Mastic, 17-461; or equal.

Studs: Studs shall be cement-in-place type, pneumatic driven type or percussive welding type, and shall have one-inch minimum diameter washers.

Insulation Inserts: Insulation inserts at pipe hangers supports for pipes 2 inches or larger shall be calcium silicate, cellular glass, or other acceptable material of the same thickness as the adjacent insulation and not less than 13-pound density.

PART 3 - EXECUTION

INSTALLATION

Insulation materials shall be neatly installed with smooth and even surfaces, jackets drawn tight and smoothly cemented down.

Insulation material shall not be installed until all pipes or surfaces to be covered are tested for leaks, cleaned and dried, and foreign materials, such as rust, have been removed.

Piping Insulation:

Piping insulation shall be in accordance with the following, except that unions, unless integral with valves, and flexible connections shall not be insulated:

1. Where insulation butts against flanges or is discontinued, insulation shall be tapered to pipe to allow for covering jacket to completely seal off end of insulation.

   Insulation shall be extended on the valve bodies up to the valve bonnet.

   Extend insulation continuous through pipe hangers and pipe sleeves. At hangers where pipe is supported, provide an insulated protection shield.

2. Jacket flap shall be sealed down with factory applied self-sealing lap. Seams shall be lapped not less than 1½ inches. Jacket shall be secured with aluminum bands installed at 12-inch centers.

3. Exposed outdoor insulation shall have an additional 0.016-inch minimum thickness aluminum jacket applied over the completed insulation. The jacket shall have a factory applied moisture barrier and shall be Childers; Smith; or equal.

   End joints shall be lapped with aluminum holding traps located directly over the lap. Additional aluminum holding straps shall be placed at 8-inch centers. Jacket at ells and tees shall be mitered, or premanufactured fitting jackets shall be provided, with additional aluminum holding bands, as required. All joints shall be sealed watertight using silicon type, heat resistant sealant.

4. In-ground insulation shall have an additional PVC jacket applied over the completed insulation and vapor barrier. PVC jacket shall be made watertight with adhesive or sealant as recommended by the PVC jacket manufacturer.

Alternate pipe insulation, where used, shall be installed on hot water piping before connections are made or the insulation may be slit lengthwise, applied to pipe and sealed with adhesive.

Pipe Safety Insulation: Pipe safety insulation shall be installed in accordance with the manufacturer's recommendations.

Duct Insulation:

Ragged edges shall be repaired or taped. Coverings shall be neatly finished at joints and edges. Each joint shall have a 2-inch minimum lap.

Where transitions are made between externally covered ducts and lined ducts, the lined duct shall be overlapped 8 inches with external covering.

Insulation shall be flush with but not cover control devices, damper controls or access doors.

Before insulation is wrapped around concealed ducts, an adhesive shall be spot applied at a maximum of 4-inch centers on each side of the ducts to prevent sagging of the insulation. Insulation shall be wrapped entirely around the ducts and shall be wired securely in place with No. 16 copper clad wire, metal bands at least ½ inch wide or plastic ties. Supports shall be spaced a maximum of 12 inches on center. Metal bands shall be installed with the use of a banding machine. Seams in the insulation shall be taped.

The finished insulation covering shall be even and level and shall not contain humps.

Plenum and Duct Liner:

Plenums and exposed ducts shall be lined with plenum and duct liner. Plenums and ducts shall be sized to provide the clear inside dimensions shown on plans after the liner is installed.

The insulation shall be applied with coated side exposed to air stream to prevent surface erosion.

The lining shall be fastened in place with adhesive and with studs with washers spaced a maximum of 18 inches on center each way.

Applying Adhesive: The adhesive shall be liberally applied over entire interior surfaces of ducts or plenums.

Stud Installation:

Studs shall be installed as follows:

1. Cement-In-Place Type Studs: Cement-in-place type studs shall be cemented in place with adhesives manufactured for this purpose and shall be as recommended by the stud manufacturer. Cement-in-place type studs shall be used where concrete walls form part of plenum.
2. Percussive Welding Type Studs: Percussive welding type studs shall be carefully welded in place with current settings that will not appreciably burn galvanizing on opposite side of the sheet metal.
3. Pneumatic Driven Type Studs: At locations where pneumatic driven type studs are used, hardened steel backup plates or dollies shall be used under the sheet metal.

12-15.04 AUTOMATIC FIRE SPRINKLER SYSTEMS, FIRE PUMPS, AND PRIVATE FIRE MAINS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of designing, furnishing and installing an automatic dry pipe type fire sprinkler system, or combination automatic wet and dry type fire sprinkler system, complete and ready for use, in accordance with the details shown on the plans and these special provisions. This work shall also consist of furnishing and installing a fire pump, a fire pump controller, and automatic transfer switch combination, and all appurtenances required, but not shown, for complete automatic operation, as shown on the plans. This work shall also consist of furnishing and installing private fire mains, fire hydrants and all appurtenances required for complete operation, as shown on the plans. All additional equipment, conduit and conductors required for complete operation shall be provided by the Contractor.

The automatic fire sprinkler systems shall include water flow indicator, check valve, dry pipe valve, air compressor, electric alarm bell, valves, sprinkler heads and related appurtenances, valves, piping and fittings.

Design:

The design of the sprinkler systems shall be in accordance with the code requirements for ordinary hazard occupancies, group 1, and shall provide coverage of the building and canopy areas shown on the plans.

The water pressure and flow rate shall be developed by vertical turbine well pumps, as shown on the plans.

SUBMITTALS

Working Drawings: Complete working drawings shall be submitted for approval.

State Fire Marshal Approval: Prior to the submittal of the working drawings, the Contractor shall have said drawings stamped "APPROVED" by the State Fire Marshal. Allow 12 weeks for State Fire Marshal review and approval.

QUALITY ASSURANCE

Codes and Standards: All work shall be in accordance with the requirements of the State Fire Marshal, the latest editions of the National Fire Protection Association (NFPA) Standard No. 13, "Installation of Sprinkler Systems," NFPA Standard No. 20, "Installation of Centrifugal Fire Pumps," NFPA Standard No. 24, "Installation of Private Fire Service Mains and their Appurtenances," and the requirements of other regulatory authorities having jurisdiction.

PART 2 - PRODUCTS

Fire Pump: Fire pump shall be a vertical shaft turbine-type pump, which meets the requirements of NFPA Standard No. 20.

Fire pump controller and automatic transfer switch (ATS2) combination: The fire pump controller and automatic transfer switch combination shall be a factory assembled, wired and tested unit and shall conform to all the requirements of the latest edition of NFPA 20, Centrifugal Fire Pumps and NFPA 70, National Electrical Code. The controller and automatic transfer switch combination shall be suitable as service entrance equipment.

Fire pump controller:

The fire pump controller shall be listed or approved by an independent testing laboratory. The controller shall bear the label of that testing agency.

The controller shall be of the combined manual and automatic type designed for full voltage starting of the fire pump motor. The controller components shall be housed in a wall mounted NEMA Type 12.

All controller components, including circuit breaker and contactors, shall be front mounted, front wired and front accessible for maintenance. The minimum withstand rating of the controllers shall not be less than 42,000 Amps RMS Symmetrical at 480 volts.

The controller shall include a motor rated combination isolating switch and circuit breaker, mechanically interlocked and operated with a single externally mounted handle. The isolating switch shall be rated to disconnect the motor load. The isolating switch/circuit breaker combination shall be mechanically interlocked such that the enclosure door cannot be opened when the handle is in the "ON" position except by a tool operated defeater mechanism.

The controller shall be microprocessor based control system. The controller shall come complete with a 4 line by 40 character LCD display mounted on a panel opening in the front door. The LCD display shall indicate the following:

1. Main screen displaying system pressure, three phase voltage and amperage readings, system frequency, date and time.
2. Set point review screen displaying the programmed pressure start and stop points and weekly test time.
3. Controller statistics including power time, motor run time, number of calls to start, number of starts, last motor start time, last motor run time, last low pressure start, maximum and minimum system voltage, maximum and minimum system frequency, maximum and minimum system pressure, last system start-up, last phase failure and reversal, last locked rotor trip, maximum run current and last locked rotor current.
4. Controller diagnostics screen, including date & time, firmware version, shop order number, customer order number, transformer output voltage, current transformer outputs, pressure transducer calibrated settings, input status and output status.
5. Display last messages screen that will display at least the last 500 alarms/messages stored in the controllers' memory.
6. Display up to five (5) custom messages of up to 100 characters each, which will continually scroll across the fourth line of the display.
7. Remaining time left on active timers.

The controller shall be supplied with green status LED's for the each of the following: Power on, Pump running, local start, remote start, deluge valve, emergency start, interlock on, low pressure.

The controller shall be supplied with red alarm LED's for each of the following: Phase reversal, Phase failure, fail to start, undervoltage, overvoltage, and low room temperature.

A "Fail-to-start" alarm shall occur if the motor controller sees less than 20% of the motor full load amps at an adjustable time delay of 1 –90 seconds. Locked rotor protection shall be provided. After a trip condition and restoration of power, the LCD display shall indicate "LOCKED ROTOR TRIP." A sequential start timer and weekly test timer shall be provided as standard.

An alarm remote bell shall be provided as shown on the plans, requiring only 120-volt supervisory power. This alarm shall give an audible alarm for "Pump Operating," "Phase Reversal" or "Pump Failure" and a visible alarm in the fire pump controller for loss of "Supervisory Power Available." This alarm shall be electrically isolated from the remote alarm contacts so that 120 VAC remote alarms can be utilized.

The controller shall include a grounding lug, bonding and spacing, required for use as listed service entrance equipment.

The manufacturer shall test the entire controller assembly prior to shipment. This test shall include, but not be restricted to, each function the controller may be required to perform including remote alarms, remote start, automatic start with manual shutdown, pressure drop start, manual start-stop.

The manufacturer shall test the circuit breaker at 300 percent full load, 600 percent full load, and short current settings.

Automatic transfer switch, ATS2:

The automatic transfer switch shall meet UL 1008 and shall be regularly subjected to Endurance, Interrupting Capacity and Dielectric Voltage-Withstand Test as outlined in UL 489 standards.

The automatic transfer switch, ATS2 shall consist of a self-contained power switching assembly. The assembly shall be installed in a barriered compartment of the fire pump controller and shall be marked "Fire Pump Automatic Transfer Switch." The automatic transfer switch shall be specifically listed for fire pump service. The complete assembly, controller and automatic transfer switch shall be shipped as a single unit.

The automatic transfer switch shall have a horsepower rating at least equalto motor horsepower rating or, when rated in amperes, shall have an ampere rating not less than 115 percent of the motor full-load current of the fire pump motor and also suitable for switching the motor locked rotor current.

The transfer switch shall have minimum withstand rating of 42,000 amps RMS Symmetrical at 480 volts. The automatic transfer switch shall be mechanically and electrically interlocked so that it shall not be possible for the load circuits to be connected to the normal and emergency sources simultaneously.

The automatic transfer switch shall have microprocessor based control system. A solid state sensing and control logic panel shall be separately mounted from the power switching portion of the transfer switch. The two sections shall be connected together by control cables and plug-in connectors. The control section shall be capable of being isolated from the power section for maintenance.

The transfer switch shall be provided with a locked rotor overcurrent protection.

A means for safe manual (nonelectrical) operation of the automatic transfer switch shall be provided. This manual means need not be externally operable.

The isolating switch, located within the automatic transfer switch enclosure or compartment, shall be provided ahead of the generator input terminals of the transfer switch.

(a) The isolating switch shall indicate when it is open.
(b) It shall operate an audible and visual signal in the pump room and at a remote point when required.
(c) The isolating switch shall be suitable for 42,000 amperes, RMS, Symmetrical at 480 volts.

The automatic transfer switch shall be provided with undervoltage sensing devices to monitor all ungrounded lines of the normal power source. When the voltage on any phase at the input load terminals of the transfer switch falls below 90 percent of motor rated voltage, the transfer switch shall automatically initiate transfer to the generator power. When the voltage on all phases of the normal source returns to within acceptable limits, the fire pump controller may be retransferred to the normal source. Phase reversal of the normal source power shall cause a simulated normal power failure upon sensing phase reversal.

Voltage and frequency-sensing devices shall be provided to monitor at least one ungrounded line of the generator power. Transfer to the generator shall be inhibited until there is adequate voltage and frequency to serve the fire pump.

Two visible indicators shall be provided to externally indicate the power source to which the fire pump controller connected. Means shall be provided to delay retransfer from the generator power to the normal source until the normal source is stabilized. This time delay shall be automatically bypassed if the generator fails. Means shall be provided to prevent higher than normal inrush currents when transferring the fire pump motor from one source to the other.

The following shall be provided:

(a) A device to delay starting of the generator to prevent nuisance starting in the event of momentary dips and interruptions of the normal source.
(b) A circuit loop to the generator whereby either the opening or closing of the circuit will start the generator.
(c) A means to prevent sending of the signal for starting of the generator when commanded by the transfer switch, if the isolation switch on the generator side of the transfer switch is open.

The fire pump controller with transfer switch combination shall each have a cautionary marking to indicate that the isolation switch for both the controller and transfer switch is opened before servicing the controller, transfer switch, or motor. A momentary test switch, externally operable, shall be provided on the enclosure which will simulate a normal power source failure.

The automatic transfer switch, ATS2 shall be provided with controls so that it has the first priority to transfer in the event there is a fire. ATS1 shall only be allowed to transfer after the fire pump has reached full load amperes. ATS2 should have 2 normally open and 2 normally closed contacts from auxiliary relays.

Water Flow Indicator: Water flow indicator shall be UL or FM listed for fire protection, vane type switch designed for wet pipe systems. Water flow indicator shall be designed for minimum flow rate of 10 GPM, and shall have an adjustable delay setting of from 0 to 90 seconds. Water flow indicator shall be Viking, Model VSR-D; Grinnell, Model F620; Reliable, Model A; or equal.

Check Valve: Check valve shall be UL or FM listed, swing type, self draining, iron body with brass trim and rubber clapper with removable cover plate. Check valve shall be Viking, Grinnell, Groeniger, or equal.

Alarm Bell: Alarm bell shall be UL or FM listed electric bell type, 120 volt AC with a minimum sound rating of 95 decibels at 10 feet. Alarm bell shall have a die cast aluminum housing with built-in rubber gasket for dust proof seal for bell striking mechanism. Alarm bell shall be Viking, Grinnell, Reliable, or equal.

Pipe and Fittings:

Pipe and fittings shall be in accordance with the requirements specified under "Pipe, Fittings and Valves," elsewhere in this Section 12-15.

Pipe and fittings for drain lines shall be as recommended by the valve manufacturer.

Pipe Hangers: Pipe hangers shall be of types listed as acceptable for specific applications in NFPA No. 13.

Valves:

Valves shall be UL or FM listed, outside screw and yoke (OS&Y) rising stem type.

Valves (OS&Y) 2½ inches and larger in size shall be Crane, 467; Walworth, 8713F; Nibco Scott, F-607-0; or equal.

Optional; Valves 4 inches and larger may be butterfly type, UL or FM listed, working pressure 175 psi, gear operated, indicator flag, ductile iron body, bronze trim, with provisions for locking. Valve shall be provided with mounting block for supervisory switch.

Supervisory Switch: Supervisory switch shall be UL or FM listed, for the type of valve supplied, single contact set with tamper resistant cover. Supervisory switch shall be suitable for exterior installations.

Sprinkler Head: Sprinkler head shall be upright type above ceiling and pendant type below ceiling. Sprinkler head shall be brass body, chemical or solder fusing type, with proper temperature rating element. Sprinkler head shall be Viking, Grinnell, Reliable, or equal.

Spare Sprinkler Cabinet: Spare sprinkler cabinet shall be metal cabinet as recommended by the sprinkler head manufacturer and conforming to NFPA requirements. The cabinet shall be painted red.

Fire Department Connection: Fire department connection shall be UL or FM listed, horizontal single or double Siamese as required, with 2½-inch inlets, drain cock, caps, chain, and brass nameplate. Inlets shall have national standard fire hose coupling screw threads. The fire department connection shall be Potter-Roemer, Grinnell, or equal.

Accessories: Drains, test connection, relief valves, flush connections, pressure gauges, and other accessories shall be supplied as required.

Sign: Sign shall be sheet steel, not less than 0.030 inch (22-gage) thick, with red letters on a white background and a baked enamel coating.

PART 3 - EXECUTION

INSTALLATION

General: Sprinkler piping and equipment shall be installed in accordance with the approved working drawings and shall be located to avoid interference with the lighting system, access openings, or other piping.

Reductions in pipe size shall be made with one piece reduction fittings. Bushings shall not be used.

Piping:

Fire sprinkler piping shall be installed level.

Drain piping and test connections shall discharge to the outside of the building.

Pipe Penetrations in Fire Rated Assemblies: Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Spare Sprinkler Cabinet: The spare sprinkler cabinet shall be installed where temperatures will not exceed 100°F at any time. Such location shall be approved by the Engineer. Twelve spare sprinklers and 2 sprinkler head wrenches shall be furnished and placed in the cabinet.

Securing Main Shutoff Valve: A galvanized chain, with a nominal material diameter of at least 7/32 inch, shall be provided to lock the main shutoff in the open position. The lock will be State-furnished as provided under "State-Furnished Materials" in Section 8, "Materials," of these special provisions.

Signs: Signs and messages shall be as required by NFPA No. 13 and the regulatory authorities having jurisdiction. Lettering shall be standard-type of the following heights:

Item	Minimum Lettering Height
Nameplate date	¼”
Drain signs	¾”
Tamper sign	¾”

FIELD QUALITY CONTROL

Acceptance Tests:

The Contractor shall arrange for testing of the automatic fire sprinkler system in the presence of the Engineer and the State Fire Marshal. Three days written notice of said testing shall be provided by the Contractor.

The system shall be pressure tested for 2 hours at 200 psig. A successful test shall have no visible leaks or loss of pressure.

The Contractor shall perform such other tests as may be required by the State Fire Marshal.

12-15.05 PLUMBING FIXTURES

PART 1 - GENERAL

SUMMARY

Scope: This work includes furnishing and installing plumbing fixtures.

DEFINITIONS

gpf: Gallons per flush.
MaP: Maximum Performance Testing Program, http://www.map-testing.com.

SUBMITTALS

Product Data: Submit for all products. Include the following:

1. Manufacturer's technical information and catalog cuts for each item. Indicate model numbers, water consumption, required options, size, and finish.
2. Fasteners, carriers, supports, and other pertinent information.
3. Explanation of abbreviations, symbols, and codes contained in schedules.
4. NSF 61 certification where required.
5. Maintenance and operating instructions, including spare parts list.

QUALITY ASSURANCE

The Engineer will inspect all fixtures for proper installation and test for proper operation after all plumbing activities are complete.

PART 2 - PRODUCTS

GENERAL

Plumbing fixtures must be white or satin finish stainless steel, commercial grade, and of vandal-resistant design.

Plumbing fixtures must comply with ASME A 112.19.2 unless otherwise specified in these special provisions.

Plumbing fixtures in contact with potable water must be certified under NSF 61.

Furnish plumbing fixtures with suitable fasteners to complete work. Exposed metal on fixtures, including wall flanges, bolts, nuts, and washers must be polished chrome plated. Exposed metal surfaces on fixture supports must be enameled to match fixtures.

WATER CLOSETS

Water Closets:

Water closets must include the flushometer, chair carrier, and appurtenances. Water closets must be low consumption type with no more than 1.6 gpf. Water closets must be floor mounted, vitreous china, siphon jet, elongated bowl, and 1-1/2 inch top spud.

Flushometers must be exposed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 1-1/2 inch top spud water closets.

Water Closets (Disabled Accessible, Floor Mounted with Flushometer):

Water closets must be vitreous china, siphon jet, 16 to 17-1/2 inches high, elongated bowl, 1½-inch top spud for exposed flush valve , and floor mounted. Water closet shall meet or exceed Americans with Disabilities Accessibility Act Guidelines (ADAAG) and ANSI Standards: A117.1 and A112.19.2.

Flushometers must be exposed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 1-1/2 inch top spud water closets.

Water Closets (Disabled Accessible, Floor Mounted with Flush Valve):

Water closet shall be satin finish stainless steel, floor mounted, siphon jet, elongated bowl, 1½-inch top spud for exposed flush valve, with solid plastic open front elongated seat with check hinges. Water closet shall meet or exceed Americans with Disabilities Accessibility Act Guidelines (ADAAG) and ANSI Standards: A117.1 and A112.19.2

Flushometers must be exposed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 1-1/2 inch top spud water closets.

Water Closet Seats: Water closet seats must be a solid plastic, open front, elongated seat with check hinges.

URINALS

Urinals:

Urinals must include the flushometer, wall hangers, and appurtenances. Urinals must be low consumption type with no more than 1.0 gpf. Urinals must be vitreous china, wall hung, washout, 3/4 inch top spud, integral shields, spreader and trap.

Flushometers must be exposed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 3/4 inch top spud urinals.

Urinal (Disabled Accessible):

Urinal shall be vitreous china, wall hung, siphon jet or washout, top spud, integral shields, spreader and trap, with 15-inch maximum extension from wall. Urinal and valve shall meet Americans with Disabilities Accessibility Act Guidelines (ADAAG)

Flushometers must be exposed, brass plated, diaphragm or piston type, with vacuum breaker suitable for use with 3/4 inch top spud urinals.

LAVATORIES AND SINKS

Lavatories:

Lavatories must be Disabled Accessible type satin finish stainless steel with back, integral perforated grid drain with overflow, self-rimming basin and drilled for 4-inch centers. Nominal dimensions must be 15.75" diameter x 5" deep. Lavatory faucets must be lever with hinged cap or push-button type operator and adjustable to remain open 10 seconds, slow-closing, self-metering, chrome–plated ADA compliant, and vandal resistant. Lavatory must be equipped with temperature controls to limit the hot water supply to 110 °F at a flow rate of no more than 0.5 gpm and be ADA compliant.

Lavatory supports must be front- or pedestal-mounted with bottom-mounted assembly if appropriate. Carriers must be adjustable for type of wall. Include required hardware.

Lavatories: Lavatories must be Disabled Accessible type self-rimming vitreous china with grid drain with overflow, and drilled for 4-inch centers. Nominal dimensions must be 10" x 18". Lavatory faucets must be single extra long lever mixing faucet complying with 24 CA Code of Regs Pt 2 § 1115B.4.3. Lavatory must be equipped with temperature controls to limit the hot water supply to 110 °F at a flow rate of no more than 0.5 gpm. Trap shall be 1¼-inch chromium plated brass exposed bent tube adjustable 17-gage minimum thickness.

Mop Sinks: Mop sinks must be acid-resisting enameled cast iron, 3-inch trap, vinyl coated rim guard, vacuum breaker faucet with hose, and wall hook. Nominal dimensions must be 28 by 28 inches.

Kitchen Sink (single basin): Kitchen sink shall be Disable Accessible type constructed of 18-gage minimum stainless steel with full undercoating. Sink shall be single compartment, self-rimmed with ledge for faucet. Nominal bowl size shall be 25 inch x 21 inch with an outside nominal depth of 5 inches or less. Sink shall be supplied with stainless steel strainer and chrome P-trap. Kitchen sink faucet shall be metal body, chrome plated, single lever mixing type with 10 inch gooseneck swing spout aerator and replaceable ceramic cartridge.

Service Sinks:

Service sinks must be acid-resisting enameled cast iron, trap standard mounted, with plain undrilled back, stainless steel or chrome plated sheet brass rim guard on three sides and complying with ASME A 112.19.1. Nominal dimensions must be 28" x 28". Wall hanger must be supplied by sink manufacturer.

Trap must be 3-inch floor mount with integral cleanout and stainless steel strainer.

Faucets for service sinks must be:

1. Solid brass construction and polished chrome plate finish
2. Wall mounted with center brace
3. Equipped with dual handles on 8-inch centers, integral stops, and vacuum breaker
4. Equipped with bucket hook and threaded hose spout that extends at least 8 inches from the wall
5. Compliant with ASME A112.18.1

WATER HEATERS

Water Heaters:

Tankless Water Heater (Electric):

Water heater shall be minimum capacity as shown on plans, designed for minimum 125 psig, interlocking (non-simultaneous) or single element, glass lined, and equipped with magnesium anodes, cold water drop tube, high temperature energy shut-off device, valved drain, high density R-8 minimum foam insulation and finished with a steel jacket with baked enamel finish. Water heater shall meet the requirements of the California Energy Commission.

Tankless flow activated electric water heater; suitable for 20 to 45 psi water pressure; 95 degrees F temperature rise; at 0.47 gpm flow rate. Heater shall be wall mounted and equipped with metal housing, stainless steel heating coils, over-temperature protection. Capacity and electrical shall be as indicated on the plans.

Temperature Valve: Tankless water heaters shall be installed with a temperature valve between the heater and lavatory faucet in a manner inaccessible from the public. Set maximum temperature at lavatory faucet to 86 degrees F.

Water heater shall be equipped with an ASME labeled, tank mounted, pressure and temperature relief valve sized for maximum input.

Water Heaters:

Water heaters must be gas fired, glass lined, high density R-16 minimum foam insulation and finished with a steel jacket with enamel finish. Water heaters must be equipped with gas pressure regulator, heat trap fittings, magnesium anodes, cold water drop tube, high temperature energy shut-off device, valved drain, and rated for at least 150 psi.

Water heaters must comply with the California Building Energy Efficiency Standards for Residential and Nonresidential Buildings, 24 CA Code of Regs Pt 6, and the California Energy Commission Appliance Efficiency Regulations.

Water heaters must comply with ANSI Z 21.10.3 and the ASME Boiler and Pressure Vessel Code.

Water heaters must be equipped with an ASME labeled, tank mounted, pressure and temperature relief valve sized for maximum input.

MISCELLANEOUS EQUIPMENT

Electric Water Coolers:

Electric water coolers must be wall mounted, simulated recessed, with stainless steel top and steel cabinet with baked enamel finish. Electric water coolers must have a self-closing, pushbutton bubbler with guard and automatic stream regulator. Electric water coolers must include loose key stop, adjustable thermostat, and cast brass p-trap. Compressors must be hermetically sealed, positive start with fan cooled condenser. Electric water coolers must have a 3-wire grounded cord and plug.

Electric water coolers must produce a minimum of 7.6 gallons of 50 °F water per hour based on an inlet water temperature of 80 °F and an ambient room temperature of 90 °F.

Where shown on the plans as accessible, electric water coolers must be wall mounted, wheelchair accessible, with heavy duty galvanized steel frame, one-piece stainless steel top, and stainless steel cabinet. Electric water coolers must have self-closing, front and side mounted pushbar actuators, shielded bubbler, and automatic stream regulator. Electric water coolers must include loose key stop, adjustable thermostat

and cast brass p-trap. Compressors must be hermetically sealed, positive start with fan cooled condenser. Electric water coolers must have a 3-wire grounded cord and plug.

Electric water coolers must produce a minimum of 7.6 gallons of 50 °F water per hour based on an inlet water temperature of 80 °F and an ambient room temperature of 90 °F.

Electric water coolers must be free standing with heavy duty galvanized steel frame, one-piece stainless steel top, and stainless steel cabinet. Electric water coolers must have pushbutton and floor pedal controls, self-closing, pushbutton bubbler with guard, and automatic stream regulator. Electric water coolers must include loose key stop, adjustable thermostat, and cast brass p-trap. Compressors must be hermetically sealed, positive start with fan cooled condenser. Electric water coolers must have a 3-wire grounded cord and plug.

Electric water coolers must produce a minimum of 7.6 gallons of 50 °F water per hour based on an inlet water temperature of 80 °F and an ambient room temperature of 90 °F.

Water Chiller:

Water chiller shall be a standard commercially manufactured remote type, 115 volts AC, air cooled with an adjustable temperature control dial, and shall produce a minimum of 13.4 gallons of 50°F water per hour based on an inlet water temperature of 80°F and an ambient room temperature of 90°F.

Water chiller compressor shall be hermetically sealed and insulated.

Water chiller shall be Haws, HRC414; Elkay, ER 14; Sunroc, RP 14 4; or equal.

Drinking Fountain: Drinking fountain shall have approximately 14 inch diameter stainless steel circular receptor and stainless steel combination drain enclosure and mounting bracket. Fountain shall be equipped with front push bar operator, 1¼ inch drain, screwdriver stop, bubbler, and vandal resistant bottom plate fasteners. Size requirements shall be as shown on the plans. Drinking fountains shall be freeze-resistant.

Emergency Eyewash and Showers:

Emergency eyewash and showers must be separate drench shower and eyebath, with 1-1/4 inch minimum powder-coated galvanized or stainless steel pipe stand with 9-inch floor mounting flange. Shower heads must have at least a 10-inch diameter ABS plastic head with a stay-open ball valve operated by a rigid pull-rod with triangular handle and equipped with 8-1/2 by 11 inch pictorial and worded emergency identification sign complying with ANSI Z 358.1 § 7.4.3.

Eyewash units must have a at least a 10-inch diameter stainless steel bowl, with anti-surge heads and circular chrome-plated spray ring operated by a stay-open ball valve operated by a flag or push handle. Eyewash units must be mounted on the pipe stand and include a dust cover assembly.

Emergency eyewash and showers must comply with 8 CA Code of Regs § 5162 and must be designated accessible and barrier-free by the manufacturer.

Emergency Eyewash: Stainless steel bowl; anti-surge heads and circular chrome-plated spray ring to bathe entire face; dust cover assembly, and stay open ball valve operated by a flag handle. Eyewash unit shall be mounted as shown on the plans. Acceptable manufacturers shall include but be not limited to Guardian, Haws, or Speakman.

Sealant: Sealant must be:

1. One component, low modulus silicone
2. Non-acid curing
3. Designed for plumbing fixture applications
4. Compliant with ASTM C 920
5. Compliant with VOC requirements of LEED IEQ Credit 4.1 and the local air district
6. Not subject to sag or flow and tack-free in 1 hour
7. Capable of 100 percent extension and 50 percent contraction without failure

PART 3 - EXECUTION

GENERAL

Seal fixtures to the wall and floor with sealant bead.

Install wall mounted fixtures on concealed carriers designed to support weight of fixture from the floor. Carriers must be made for the specific fixture to be supported and for the installation conditions.

Furnish fixtures with accessible compression stops.

Wrap hot water supply, trap and tailpiece on lavatories under "Pipe Insulation," of these special provisions.

INSTALLATION

Install flush valves for fixtures shown on the plans as disabled accessible so that the valve handle is on the widest side of the toilet space.

Install water closets under the manufacturer's instructions. Water closets shown on the plans as disabled accessible must be installed with disabled accessible flush valve. Install water closet seats.

Install urinals under the manufacturer's instructions. Install service sink faucets on the wall above the sink-back with the spout outlet 16 inches above the service sink rim.

Install mop sink faucets on the wall above the sink-back with the spout outlet 36 inches above the floor.

Install water heaters with seismic restraints, inlet ball valve, insulating connections, and 3/4-inch pressure and temperature relief valve. Install relief valve drain pipe as shown on the plans.

Water chiller: Water chiller shall be installed with brackets, adequately sized and bolted to the wall.

Insulation: All hot water supply, and water pipe between the water chiller and drinking fountains shall be wrapped with insulating material.

Install emergency eyewash and shower with a rigid bracket located 48 inches above the floor. Bracket must be at least 16-gauge galvanized or powder coated steel and attached to the wall.

FIELD QUALITY CONTROL

Testing:

The Contractor shall test piping in accordance with the requirements specified elsewhere in these special provisions.

All installed fixtures shall be tested for proper operation after all plumbing work has been completed.

12-15.06 LIQUEFIED PETROLEUM GAS (LPG) SYSTEM

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a liquefied petroleum gas (LPG) distribution system in conformance with the details shown on the plans and these special provisions.

The LPG distribution system shall include an LPG storage tank, pipe, fittings, valves and such other system components necessary for the proper installation and operation of the LPG system.

Permits: The Contractor shall obtain the required permits to operate pressure vessels in conformance with the requirements of the State Division of Industrial Safety (DIS), shall pay the costs for such permits, and shall perform all required tests. Such permits shall be posted under glass at the site of the work.

QUALITY ASSURANCE

Codes and Standards: All work performed and materials installed shall conform to the requirements in the California Building Standards Code, Title 24, Part 4 and Part 5; the California Code of Regulations, Title 8, Chapter 4, Subchapter l, Article 5; and National Fire Protection Association (NFPA) Standard No. 58-2004 and the 2007 California Fire Code.

PART 2 - PRODUCTS

Tank: Tank shall be constructed and stamped for 250 psig working pressure in conformance with the requirements in the ASME Code for "Unfired Pressure Vessels for Petroleum Liquids and Gases." Tank shall have certification of testing for 375 psig. Tank shall include a rainhood with top opening for relief valve and welded steel supports with provisions for bolting to the concrete foundation. Tank shall be painted white.

Tank Valves, Fittings, Regulators and Accessories: Tank valves, fittings, regulators and accessories shall be UL listed and labeled. Valves, fittings, regulators and accessories shall be as required by the California Codes listed above and shall be Rego, Fisher, Rockwell, or equal.

Pipe and Fittings (at the Tank and Underground): Pipe and fittings shall be as specified under "Pipe, Fittings and Valves" in Section 12-15, "Mechanical," of these special provisions. Piping below grade shall be factory coated.

Warning Signs: Warning signs shall be sheet steel, not less than 0.048 inch thick (18-gage) with a baked enamel coating and shall have red letters on a white background.

PART 3 - EXECUTION

INSTALLATION

The LPG tank and system components shall be installed in conformance with the requirements in NFPA Standard No. 58-2004, the manufacturer's instructions and the approved installation drawings.

Foundation:

The tank shall be installed on a concrete foundation. The tank installation shall include seismic restraint and provisions for expansion and contraction. Neoprene or asphalt impregnated felt anti-corrosion pads shall be installed between the saddle and the concrete foundation.

The concrete foundation shall be constructed in conformance with the provisions for minor work under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions.

All openings shall be capped until ready for field connections. Piping shall be supported adequately, with allowance for swing joint movement.

Piping Installation:

Piping shall be buried a minimum depth of 36 inches and shall be provided with cathodic protection. Insulating unions shall be installed at least 6 inches above grade between the coated pipe and the above ground pipe lines.

Joints for underground piping shall be cleaned, primed and wrapped in conformance with the provisions in "Pipes, Fittings and Valves" in Section 12-15, "Mechanical," of these special provisions. The cleaning, priming and wrapping of pipe joints shall be completed after testing the piping system.

Cathodic protection shall be installed in conformance with the details shown on the plans and the provisions in "Cathodic Protection" in Section 12-16, "Mechanical," of these special provisions.

Coated Pipe Inspection: The coating on all coated pipe shall be inspected for flaws prior to any testing, and shall be reinspected after testing and before the cleaning, priming and wrapping of the joints.

Tank Finish:

If the tank coating substrate is damaged during installation, the tank shall be repaired to its original condition at the expense of the Contractor.

The word "FLAMMABLE" shall be painted on each side of the tank. Sign lettering shall be standard-type not less than 4 inches in height. The lettering color shall be red.

Warning Sign Installation and Application: Four warning signs with the words "NO SMOKING, OPEN FLAMES OR OTHER SOURCE OF IGNITION PERMITTED WITHIN 50 FEET" shall be placed at the locations shown on the plans. Sign lettering shall be standard-type not less than 1½ inches in height. The lettering color shall be in sharp contrast to the color of the sign.

FIELD QUALITY CONTROL

Testing:

After construction, installation and pipe testing, the LPG system shall be pressure tested with air or nitrogen. The system shall be tested for a minimum time period of 30 minutes at 200 psig. If any leaks are detected during the test, the system shall be repaired and retested until no leaks are detected.

After the pressure tests have been completed, the LPG system shall be purged 5 times with methanol (methyl alcohol), using one gallon per 1,000 gallons water capacity, to remove moisture from the system.

After testing and purging the system, the tank shall be filled to 25 percent of the water capacity of the tank, measured in gallons, with State-furnished LPG as provided under "State-Furnished Materials" in Section 8, "Materials," of these special provisions.

An operational test shall be performed on the LPG system upon completion of the pressure tests, the purging of the system and the delivery of the State furnished LPG fuel. The operational test shall consist of operating all LPG equipment for a period of three 24-hour days.

12-15.07 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

PART 1 - GENERAL

Scope: This work shall consist of furnishing, installing and testing heating, ventilating and air conditioning (HVAC) equipment and systems in accordance with the details shown on the plans and these special provisions.

The performance rating and electric service of the HVAC equipment shall be as shown on the plans.

Temperature Controls: Thermostats, relays, timer switches, and other sensor type control devices required for this work shall be furnished and installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring shall be furnished and installed in accordance with the requirements specified in Section 12-16, "Electrical," of these special provisions.

Codes and Standards:

Equipment and systems shall conform to California State Energy Commission Regulations and, where applicable, shall be American Refrigeration Institute (ARI), American Gas Association (AGA), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association (AMCA) approved for performance ratings and application shown on the plans.

Any appliance for which there is a California standard established in the Appliance Efficiency Standards may be installed only if the manufacturer has certified to the Commission, as specified in those regulations, that the appliance complies with the applicable standards for that appliance. Space conditioning equipment may be installed only if the manufacturer has certified that the equipment meets or exceeds all applicable efficiency requirements listed in the Energy Efficiency Standards.

PART 2 - PRODUCTS

HEATING AND COOLING UNITS

Furnace:

Furnace shall be gas fired, sealed combustion system, induced draft, high efficiency, listed condensing furnace. Furnace shall be AGA approved for LPG, shall be equipped with electronically controlled blower and hot surface ignition. Furnace cabinet shall have an enamel finish and the primary and secondary heat exchangers shall be corrosion resistant construction. Blower shall be vibration-isolated.

Furnace shall be listed for use of plastic combustion and vent pipe from the unit to the outside of the building. Combustion air and vent pipe shall extend through a single concentric terminal assembly supplied by the furnace manufacturer. Dual pipe penetrations shall not be allowed.

The fan and fan motor shall provide the specified air circulation, with filters, against external static pressure as shown on the plans.

With two furnaces shown side by side on the plans, the furnaces installed shall be a commercially available unit designed to be twinned and a twinning kit shall be provided. Heating and fan performance shall be per furnace and the cooling capacity shall be the total capacity of the twinned furnaces.

Furnace shall have multi-speed fan motor with thermal overload protection and shall be factory wired for a single power connection, including provisions for optional air conditioning, and low voltage control circuit with a terminal board. Furnace shall have auxiliary contacts to de energize system when smoke detectors indicate the presence of smoke.

Split system furnace/air conditioner shall include a cased evaporator coil, a remote outdoor condensing unit and economizer. Indoor evaporator coil shall be a factory assembled unit by the forced air furnace equipment manufacturer. Furnace and cased coil unit shall be designed to mate with each other. Unit shall be provided with a refrigerant metering device and corrosion-resistant condensate drain pan with drain connections. The wetted coil air friction shall not exceed 0.3-inch water column. The cased coil unit shall have the same finish as the furnace.

Refrigerant lines and condensate drain piping shall be as specified elsewhere in these special provisions.

Outdoor condensing unit shall be same manufacturer as indoor unit; air cooled, factory assembled, charged and tested, and wired for single point power and control connections. Unit shall be enclosed in a weatherproof acoustically lined cabinet with access panels and a baked-on enamel finish. The compressor shall be the hermetically sealed type, pressure relief valve, high and low pressure switches, liquid-line filter-dryer, crankcase heater, short cycling protection, and service valves.

Heat Pump (Split System):

Heat pump (split system) shall be factory matched unit consisting of indoor fan coil unit with electrical resistance heating, outdoor condensing unit and economizer.

Refrigerant lines and condensate drain piping shall be as specified elsewhere in these special provisions.

Outdoor condensing unit shall be factory-assembled, air-cooled, charged and tested, factory-wired for single point power and control connections, and shall be enclosed in a weatherproof acoustically lined cabinet with convenient access panels and a baked-on enamel finish. The compressor shall be the hermetically sealed type, and shall be provided with quick start components, pressure relief valve, high and low pressure switches, liquid-line filter-dryer, crankcase heater, short cycling protection, and service valves.

Indoor fan coil unit shall be adjustable V-belt drive type or the multi-speed direct drive type. The motor shall be provided with thermal overload protection.

The indoor coils shall be provided with refrigerant metering devices, check valves, and filter-dryers.

Cabinet shall be fabricated of heavy-gage, mill galvanized steel, and shall be lined with fire retardant insulation, with baked-on enamel finish and condensate drain pan.

Fan-coil unit shall provide the required air flow against the external static pressure shown on the plans.

Electric resistance heater shall be UL listed for the intended use, factory installed and shall be pre-wired for convenient hookup.

Combination Heating/Cooling Unit (single package - rooftop):

Combination Heating/Cooling Unit shall be standard, commercial quality, single package, curb pump mounted unit with weatherproof acoustically lined cabinet. The cabinet shall have convenient access panels and a baked-on enamel finish. The roof curb shall be insulated and shall be supplied by the unit manufacturer.

Unit shall be specially designed for continuous compressor operation in the heating mode and shall be protected by a suction-tube accumulator.

Unit shall be provided with positive pressure combustion and mechanical flue gas venting and furnace safety controls.

Compressor shall be hermetically sealed unit, vibration isolated, short cycling protection, pressure relief valve, high and low pressure switches, liquid-line filter-dryer and crankcase heater.

Indoor air blower shall be adjustable V-belt drive type. The fan and fan motor shall provide the specified air flow, with wet coil, against the external static pressure as noted on the plans.

Motors shall have integral thermal overload protection.

Electric resistance heater shall be supplied by the heat pump manufacturer, factory installed and shall be pre-wired for convenient hookup.

Unit shall be provided with an economizer.

Economizer: Economizer shall be modulating type assembly either provided by the manufacturer or fabricated to match the unit. The economizer shall be complete with damper motor and linkage for full range modulation of the outdoor and return air dampers, barometric damper, screened rain hoods, factory wiring for convenient connections, automatic compressor lockout, minimum position damper control, and air filters sized to have a maximum velocity of 400 feet per minute, all installed in an enclosure similar in color to the basic unit with paint applied by the manufacturer of the economizer. Barometric damper area shall be equal to outside air

intake area and be capable of relieving 100 percent of the rated air conditioning unit. The economizer shall be constructed to meet SMACNA requirements and shop drawings shall be submitted prior to fabrication.

Evaporative Cooler:

Evaporative cooler shall be a factory assembled unit having removable side panels with filters and a bottom drain. The cabinet shall be fabricated from galvanized steel sheet metal with a baked-on enamel finish. Interior surfaces of the cabinet bottom shall be asphalt coated. The drain fitting shall be threaded for connection to drain piping.

All parts of the float valve and recirculating pump, which come into contact with water, shall be of stainless steel or other corrosion resistant material.

The control switch shall be a 6-position switch with the following selective settings: cooling, fan only, high speed, low speed, pump only and off.

The evaporative cooler shall be Williams; Essick; Universal; or equal.

Unit Heater:

Unit heater shall be gas-fired, propeller fan type, AGA approved for LPG and shall be equipped with aluminized steel heat exchanger, built in backdraft diverter, fan switch marked "SUMMER"-"WINTER," adjustable discharge louvers, gas pressure regulator, intermittent ignition device, gas main and pilot shutoff valves, automatic gas valve, high limit shutoff, 24-volt transformer, and fan motor local disconnect. All components shall be factory assembled. Unit heater shall be Reznor; Modine; Hastings; or equal.

Unit heater fan motor shall have integral thermal overload protection.

Low Intensity Radiant Heater:

Low intensity radiant heater shall include power burner, radiant tube, reflector, vacuum exhaust unit, controls, hangers, and appurtenances as necessary for proper installation and operation. System shall be AGA certified and rated for natural gas LPG.

Burner shall be equipped with direct spark ignition, flame safety control and combustion chamber inspection sight glass.

Vacuum exhaust shall be suitable for multiple burner usage as shown on the plans. Exhaust unit fan shall have stainless steel fan wheel, 16-gage aluminized steel housing, with vibration isolating mounts, discharge bird screen, and flexible supply connection. Vacuum exhaust motor shall have built-in thermal overload protection.

Low intensity radiant heater controls shall consist of gas and burner controls.

Reflectors, hangers, supports and fasteners shall conform to the low intensity radiant heater manufacturer's recommendations.

Electric Infrared Radiant Heater:

Electric infrared radiant heater shall have quartz tube heating element(s) and a 45 degree (minimum) radiation pattern oriented toward the floor. All components shall be factory assembled. Electric infrared radiant heater shall be provided with a metalic rectangular reflector. Electric infrared radiant heater shall be Fostoria, Chromalox, Qmark, Heatrex, or equal.

Automatic controls shall be provided to shut off the electric ignition if the pilot fails to light.

LPG Infrared Radiant Heater:

High intensity infrared radiant heater shall be AGA approved for LPG and shall be equipped with intermittent ignition device, electric flame safety, and junction box secured to the unit. All components shall be factory assembled. Radiant heater shall be provided with an aluminum rectangular reflector and mounting brackets. High intensity infrared radiant heater shall be Solaronics; Lambert; or equal.

Automatic controls shall be provided to shut off the electric ignition if the pilot fails to light.

Air Conditioner (Wall Mounted): Air conditioner (wall mounted) shall be through-the-wall type, cooling only, rotary type compressor, and shall include slide-out chassis design, thermostat, adjustable discharge grilles, multi-speed fan, and integral thermal overload protection.

Heat Pump (Ductless): Heat pump shall consist of an outdoor condenser unit with an indoor fan/coil unit. The condenser unit shall consist of a rotary type compressor, condensing coil, fan and all controls, tubing and appurtenances required for a complete operating system. The indoor fan coil units shall consist of an evaporating coil, expansion control device, propeller fan, auxiliary electric heat strips and thermostat. In addition, the indoor unit shall come with a plug or local disconnect. The system shall provide heating or cooling as required by the thermostat. Units shall be Sanyo, Mitsubishi Electric, Toshiba, or equal.

FANS AND VENTILATORS

Exhaust Fan (Ceiling Mounted): Exhaust fan shall be ceiling mounted, AMCA certified and shall be equipped with grille, backdraft damper and metal housing. Exhaust fan motor shall have integral thermal overload protection. Ceiling exhaust fan shall be Breidert, ILG, Penn, or equal.

Exhaust Fan (Wall Mounted): Exhaust fan shall be wall mounted, AMCA certified and shall be equipped with grille, metal housing, backdraft damper, centrifugal fan wheel and bird screen. Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan shall be completely weatherproof and shall have a disconnect means under the hood and fan motor shall have integral thermal overload protection. Wall exhaust fan shall be Jenn-Air; Carnes; EWDA; Penn; or equal.

Declassification Fan (Wall Mounted):

Declassification fan shall be wall mounted, propeller type, AMCA certified, direct drive, aluminum blades, metal housing, venturi orifice, and safety grills. Declassification fan shall be constructed in accordance with the requirements of the latest of AMCA Publication 99, "Standards Handbook."

Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan motor shall be 3-phase, continuous duty and explosion proof. Fan motor shall be single phase, continuous duty, and explosion proof with integral thermal overload protection.

Wall declassification fan shall be supplied with wall mount collar, motor side guard, backdraft damper and weatherhood. Weatherhood shall be galvanized steel with bird screen. All parts shall be supplied by the fan manufacturer.

Exhaust Fan (Utility Set):

Exhaust fan shall be centrifugal type, Greenheck, Acme, Ilg or equal. Fan shall have adjustable belt drive, spark resistant fan wheel, screened discharge outlet, backdraft damper, drain fitting, vibration isolators and complete weatherproof enclosure.

Fan shall be AMCA certified and exhaust fan motor shall be equipped with integral thermal overload protection and local disconnect.

Combination Heat Lamp/Light/Fan: Combination heat lamp/light/fan shall be ceiling mounted, recessed type unit with metal housing, grille and backdraft damper. Ducting size shall be as required by the manufacturer. Combination heat lamp/light/fan shall be Broan, No. 164; Nutone, No. 9427; or equal.

Roof Fan: Roof fan shall be AMCA certified and shall be equipped with metal housing, centrifugal fan wheel, backdraft damper and bird screen. Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan motor shall have integral thermal overload protection. Roof fan shall be completely weatherproof and shall have a disconnect means under the hood. Roof curb shall be insulated and shall be supplied by the fan manufacturer. Roof fan shall be Penn; Jenn-Air; Cook; or equal.

Roof Ventilator: Roof ventilator shall be stationary, gravity type, and shall have a damper and chain type operating device. Roof curb shall be supplied by the ventilator manufacturer.

HVAC CONTROLS

Unit Heater Thermostat: Unit heater thermostat shall be low voltage type, single set point range internally adjustable from 40°F to 80°F, and provided with a blank cover.

Radiant Heater Thermostat: Radiant heater thermostat shall be line voltage type, single set point range internally adjustable from 40°F to 80°F, and provided with a blank cover.

Thermostat (Office Only): Thermostat shall be 24-volt, 7-day programmable, electronic heating/cooling thermostat, with the ability to program the fan-on mode during normal working hours, and fan-off mode during unoccupied periods. Thermostat shall be provided with sub-base selector switches for "AUTO-HEAT-OFF-COOL" and fan "AUTO-ON." Thermostat shall be auto-changeover type, and have full temperature range setback capacity. Thermostat shall be Robertshaw, 7900; Honeywell, T7300; or equal.

Time Switch: Time switch shall be one-hour, spring-wound, "OFF" type time switch without a "HOLD" feature. Time switch shall be Intermatic, Type F60M; Tork, A500 Series; or equal.

AUXILIARY HVAC COMPONENTS

Unless specified herein, all components shall be sized and have the characteristics as shown on the plans.

Rigid Ductwork: Rigid ductwork shall be galvanized steel sheet metal conforming to the latest edition of the SMACNA "Low Velocity Duct Construction Standards." Galvanized steel shall be cleaned by washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.

Spiral Duct: Spiral duct shall be prefabricated type.

Duct Supports: Duct supports shall be hot-dip galvanized steel.

Flexible Ductwork: Flexible ductwork shall be UL 181, Class 1 air duct rated and shall meet the requirements of NFPA 90-A. Duct shall have steel helix wire, flexible insulation, minimum thermal resistance of R-8, and flame resistant vapor barrier. Inner and outer surfaces shall be non-metallic. Outer surface shall be Copolymer or Mylar, factory applied.

Flexible Connection: Flexible connection shall be prefabricated type and shall be commercial quality flexible glass fabric coated on both sides with neoprene or hypalon.

Ceiling Diffuser (for Gypsum Board Ceilings): Ceiling diffuser for gypsum board ceilings shall be rectangular or square type. Diffuser shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, equipped with a removable core and a standard flanged frame with sponge rubber or felt gasket. Diffuser shall have individually adjustable curved blades, counter-sunk screw holes, shall be surface mounted, with face velocity less than 600 feet per minute; Titus, 250; Air Mate, 400-O; Hart and Cooley, A40; or equal.

Return Register (for Gypsum Board Ceilings): Return register for gypsum board ceilings shall be rectangular or square, and shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, fixed bar type, die formed louvers set at 45 degrees, ½-inch spacing maximum, surface mounted; Titus, 335; Air Mate, 280; or equal.

Ceiling Diffuser (for Suspended Ceilings): Ceiling diffuser for suspended ceilings shall be 24 inches square. Diffuser shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, perforated face hinged for easy access, and shall be fitted with fully adjustable air pattern controllers, a removable core, and a standard flanged frame; Titus, PAS; Air Mate, 700; or equal.

Return Register (for Suspended Ceilings): Return register for suspended ceilings shall be 24 inches square, steel or extruded aluminum, perforated face hinged for easy access; Air Mate, 700RA; Titus, PAR; or equal.

Wall Supply Register: Wall supply register shall be double-deflecting adjustable type, with vertical face bars and horizontal rear louvers, steel with oven baked-on enamel bone white finish or extruded aluminum, flanged frame with sponge or felt gasket; Hart and Cooley T62; Air Mate 240-HO or equal.

Wall Return Register: Wall return register shall be single deflecting type, with horizontal adjustable louvers, steel with oven baked-on enamel bone white finish or extruded aluminum, flanged frame with sponge or felt gasket; Hart and Cooley, T70; Air Mate, 200-HO; or equal.

Volume Damper: Volume damper shall be opposed blade type, operable from face with screw driver or Allen-head wrench, shall be same manufacturer as diffuser or may be furnished as part of the diffuser.

Fire Damper: Fire damper shall be approved or listed by the State Fire Marshal. Each fire damper shall have an approved fusible link with a temperature rating 50°F above normal maximum operating temperature, and precision machined bronze sleeve type bearings. Fire damper shall have all steel parts factory painted with an oven baked-on metal primer and enamel finish.

Combination Smoke and Fire Damper: Combination smoke and fire damper shall be approved or listed by the State Fire Marshal. Damper assembly shall be 1 1/2 hour fire rated under UL Standard 555 and be a Leakage Rated Damper for use in smoke control systems meeting the requirements of the latest version of UL 555S. Combination smoke and fire damper shall be equipped with a fusible link rated at 165°F, have a 115-volt shaded pole motor actuator and an approved smoke detector. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Damper and actuator shall be supplied as a single entity which meets all applicable UL Standards. Damper shall have all galvanized steel parts. Damper shall be installed at the locations shown on the plans.

Balance Damper: Balance damper shall be butterfly type, 16-gage (minimum) galvanized steel blade, end bearings with steel shaft and locking and indicator operator. Balance damper shall be Ventlock, Young, Anemostat, or equal.

Air Filter (for HVAC Units): Air filter shall be permanent metal viscous impingement type, constructed of aluminum or galvanized steel, 2-inch minimum thickness and be approved for Class 2 use. Filter shall have a minimum efficiency rating of 50 percent as determined when tested in accordance with ASHRAE Test Standard 52. Filter shall be mounted in 16-gage galvanized steel holding frames. Two cans of recharging adhesive shall be provided with the filter and shall be nearly odorless, have a high flash point, rapid wetting characteristics, dye tracer and be water soluble. Filter shall be Airspan, Type AF, Eco-Air Products, Inc., Type HIA; Snyder General, Type AAF; or approved equal.

Air Filter (for Truck Inspection Facilities): Air filter for truck inspection facilities shall be throwaway type, 2-inch minimum thickness, shall be approved for Class 2 use, shall have an average efficiency rating of between 30 and 35 percent as determined when tested in accordance with ASHRAE Test Standard 52, and shall be mounted in 16-gage galvanized steel holding frames.

Vents and Flues (for Heaters): Vents and flues for heaters shall be approved Type B or approved plastic vents for condensing furnaces.

Refrigerant and Condensate Drain Piping: Refrigerant and condensate drain piping shall be rigid, Type L copper tubing with brazed solder fittings. The suction line shall be insulated, with vapor barrier and shall be weatherproofed for exterior installation. Factory sealed tubing shall not be used.

PART 3 - EXECUTION

INSTALLATION

Heaters:

Furnaces, unit heaters, electric quartz radiant heaters and wall heaters shall be installed in such a manner as to insure adequate furnace clearance and separation of combustion air and circulating air. Appliances shall be connected to a rigidly mounted gas pipe supply system by an AGA approved flex connector and gas valve.

Wall heater shall be installed so that the pilot light and bottom of the combustion chamber are at least 18 inches above the floor.

Electric quartz Radiant heaters shall be suspended by ¼-inch minimum carbon steel chain and eye bolts. Heaters shall be angled to minimize heating of adjacent walls.

Ventilators:

Exhaust ducts connected to exhaust fans shall be routed as shown on the plans and shall terminate in a weatherproof cap. Duct sizes shall be as shown on the plans or as recommended by the manufacturer, whichever is larger.

Roof fans shall be curb mounted.

Condensate Drains: Air conditioning units and heat pumps shall be provided with condensate drain trap and piping. Outdoor piping shall extend to the nearest roof drain, gutter or as shown on the plans. Air gap shall be installed where required by code. Interior condensate drain piping shall be insulated with foam insulation.

Evaporative Cooler: Roof mounted evaporative cooler shall be provided with drain piping routed to the nearest roof drain or gutter. Air gap shall be installed where required by code. Wall mounted evaporative cooler shall be provided with drain piping routed to within 6 inches of the ground.

Mounting Heights: Thermostats and time switches shall be installed as shown on the plans.

Temperature Controls:

Temperature control for each radiant heater shall be provided by 2 low voltage thermostats and a time switch. One thermostat shall be set at 45°F for low-limit temperature control and the second thermostat shall be set at 70°F. The first thermostat shall energize the heater whenever the temperature is below the setpoint. The second thermostat shall be wired in series with the time switch and shall de-energize the heater above the setpoint.

Each thermostat shall be insulated from the outside walls, and shall be provided with an aluminum radiation shield above the thermostat.

The time switch shall be installed beside the thermostat or where shown on the plans.

Air Outlets: Volume dampers shall be furnished and installed for all diffusers. Blocking shall be provided on all sides of air outlets between ceiling or wall joists. Collars shall be supplied for all outlets and shall be taped and sealed in place.

Vents and Flues: Vents and flues shall be securely fastened to the building construction, shall be provided with a collar at all ceiling penetrations and shall terminate with a weather cap fabricated of the same material.

Access Door: Access doors shall be provided in rigid ducts and plenums for access to volume dampers, fire dampers and control devices located within such ductwork; and shall be provided at such other locations as shown on the plans.

Ducts and Vents:

Ductwork within the building shall be installed to clear lighting fixtures, doors, windows and other obstructions. Ductwork shall preserve head room and shall keep openings and passageways clear whether shown on plans or not.

Ductwork shall be installed and braced according to the latest edition of the SMACNA "HVAC Duct Construction Standards."

Slopes in sides at transitions shall be approximately one to five. The ductwork system shall not contain abrupt changes or offsets of any kind unless otherwise shown on the plans.

Where ducts pass through walls, floors or ceilings, galvanized sheet metal or steel angle collars shall be installed around the ducts.

Duct sections shall be connected by beaded sleeve-type couplings using joint sealer as recommended by the duct manufacturer. Duct sections shall be mechanically fastened with pop rivets or sheet metal screws and sealed with mastic or insulated, reinforced silver tape.

Flexible connections shall be provided at both inlet and outlet of fan coil and ventilating units.

Sheet metal plenums shall be adequately braced and supported from the floor or structure with structural steel angles to prevent sagging, flexing and vibration.

All standing seams and transverse joints of supply, return and exhaust ducts and seams around plenums, fan and coil housings shall be sealed with sealant and taped.

Duct Penetrations in Fire Rated Assemblies: Where ductwork passes through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Ductwork Identification:

Ductwork shall be identified as follows:

Duct Description	Identification Symbol
Supply duct	S
Return duct	R
Exhaust duct	EXH
Outside air duct	OA

Identification symbol letters shall be stenciled at locations visible from the access routes to be used by maintenance workers. Such letters shall be painted with black colored paint and shall be a minimum of 2 inches high.

FIELD QUALITY CONTROL

Pre-test Requirements:

Before starting or operating systems, equipment shall be cleaned and checked for proper installation, lubrication and servicing.

In each system, at least one air path, from fan to final outlet, shall have all balance dampers open. The final air quantities shall be achieved by adjusting the volume dampers or the fan RPM.

Final adjustments and balancing of the systems shall be performed in such a manner that the systems will operate as specified and as shown on the plans.

The Contractor shall replace or revise any equipment, systems or work found deficient during tests.

All automatic operating devices which are pertinent to the adjustment of the aforementioned air systems shall be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work shall be done in collaboration with the control manufacturer's representative.

Project Completion Tests:

The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

The project completion tests shall consist of the following:

1. Air Systems: All air systems shall be tested and balanced to the conditions set forth on the plans and in these special provisions. This work shall be performed by an Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certified contractor. The air systems include, but are not necessarily limited to, the following:

   a. Supply air systems
   b. Return air systems
   c. Exhaust air systems

2. Operational Data: The tests shall include operation of the heating, cooling, and ventilating systems for not less than two 8-hour days, each system shall operate at not less than 90 percent of their full specified capacities.

   The required data shall be accurately measured. The data shall be measured during one operational cycle in the presence of the Engineer and shall be submitted for approval.

   The following data shall be measured and tabulated:

   a. Ambient temperatures and conditions, °F
   b. Supply and return air quantities, CFM, each room
   c. Thermostat set point, °F
   d. Air temperatures at room center, °F
   e. Fan motor amperages and voltages
   f. System static pressures, inches of water column

SECTION 12-16. ELECTRICAL

12-16.01 ELECTRICAL WORK

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of performing electrical work including furnishing all labor, materials, equipment and services required to construct, connect and install the complete electrical system in accordance with the details shown on the plans, the provisions of Section 51, "Concrete Structures," the provisions of Section 56, "Signs," and the provisions of Section 86, "Electrical Systems," of the Standard Specifications and these special provisions. Section 86-8, "Payment," of the Standard Specifications shall not apply.

Related Work: Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical system shall be done in conformance with the provisions in these special provisions.

SYSTEM DESCRIPTION

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

QUALITY ASSURANCE

Regulatory Requirements: All electrical work performed and materials installed shall be in conformance with the provisions in Section 74-1.02, "Regulations and Code," of the Standard Specifications, and the requirements in the CA Code of Regs, Title 24, Part 6, "California Energy Code."

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

TESTING

After the installation work for the various systems has been completed, each electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical systems function properly. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense.

Final inspection for the completed electrical system will take place after all the various systems have been tested.

The Engineer shall be notified 15 days in advance of testing and State personnel training on the jobsite. When a Manufacturer's Representative is required on the jobsite as specified in these special provisions, the Engineer shall be notified 15 days in advance.

Insulation resistance test shall not be performed on cables rated less than 600 volts.

Paragraphs 2, 3, 4, 5, and 6 of Section 86-2.14C, "Functional Testing," shall not apply.

The Contractor shall be responsible for the compatibility and adjustment of all systems and components as necessary for the successful operation of the electrical service, lighting system, the vehicle monitoring system and the building electrical system.

The systems shall be operated and tested by the Contractor to demonstrate satisfactory performance to the Engineer. Any deficiencies revealed shall be corrected promptly by the Contractor and such operations and tests shall be performed as may be necessary to demonstrate satisfactory performance, all without additional cost to the

The functional test shall be 5 days of continuous trouble-free operation. In the event any of the above functional test fail to perform satisfactory during the functional test, the test shall be repeated at a later date and all costs to the State observing the subsequent test will be at the Contractor's expense. Such costs will be deducted from the payments due to Contractor.

12-16.02 BASIC MATERIALS AND METHODS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing the basic materials of the electrical work, including conduits, conductors, fittings, and wiring devices, in accordance with the details shown on the plans and these special provisions. The basic materials shall include those accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the electrical system.

Related Work:

Roof penetrations shall be flashed and sealed watertight in conformance with the provisions in "Sheet Metal Flashing" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Where conduits pass through fire rated walls, floor or ceiling assemblies, the penetrations shall be protected in conformance with the provisions in "Through-Penetration Firestopping" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS

Product Data:

A list of all materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.

Manufacturer's descriptive data shall include catalog cuts, complete description, performance data and installation instructions for the materials and equipment specified herein.

PART 2 - PRODUCTS

CONDUITS AND FITTINGS

Rigid Steel Conduit and Fittings: Rigid steel conduit and fittings shall be Type 1 in conformance with the provisions in Section 86-2.05A, Subparagraph A, "Material," of the Standard Specifications. Type 1 conduit shall have steel or malleable iron fittings. Fittings shall be threaded unless otherwise specified or shown on the plans. Split or three-piece couplings shall be electroplated, malleable cast iron couplings. Insulated grounding bushings shall be threaded malleable cast iron body with plastic insulated throat and steel, lay-in ground lug with compression screw.

PVC Coated Rigid Steel Conduit and Fittings: PVC coated rigid steel conduit and fittings shall be Type 2 in conformance with the provisions in Section 86-2.05A, Subparagraph B, "Material," of the Standard Specifications.

Electrical Metallic Tubing (EMT) and Fittings:

EMT shall be formed of cold rolled strip steel, zinc coated, and interior lined in conformance with the requirements in UL Standard 797 and ANSI C 80.3.

Couplings shall be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors shall be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated thermoplastic throat.

Flexible Metallic Conduit and Fittings:

Flexible metallic conduit shall be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design.

Fittings shall be electroplated screw-in type with malleable cast iron body and threaded male hub with insulated throat.

Rigid Non-Metallic Conduit and Fittings: Rigid non-metallic conduit and fittings shall be Type 3 in conformance with the provisions in Section 86-2.05A, Subparagraph C, "Material," of the Standard Specifications. Terminal adapters for adapting PVC conduit to boxes, threaded fittings, or metallic conduit system shall be PVC adapters with threads on one end and socket type on the other end.

Liquidtight Flexible Metallic Conduit and Fittings: Liquidtight flexible metallic conduit and fittings shall be Type 4 in conformance with the provisions in Section 86-2.05A, Subparagraph D, "Material," of the Standard Specifications. Fittings shall be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

CABLES AND CONDUCTORS

Radiation Detection Ethernet Cable: Radiation detection Ethernet cable shall be Category 5E, 24 AWG, copper conductors, individually sealed complete with drain wire.

Radiation Detection Power Cable. Radiation detection power cable shall be 12 AWG, 19-strand minimum, 3-conductor cable with insulation suitable for underground use.

Conductors:

Conductors shall be stranded copper wire of the size shown on the plans. Conductors shall conform to the requirements in ASTM B3 and ASTM B8. Conductor size shall be based on AWG, except that conductor diameter shall be not less than 98 percent of the specified AWG diameter.

Conductor insulation types shall be as follows:

1. Conductors in control panel enclosures shall be Type MTW.
2. Conductors in wet, underground, or outdoor locations shall be Type XHHW-2.
3. All conductors other than Type MTW and XHHW-2 shall be Type THHN.

Wire Connections and Devices: Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

ELECTRICAL BOXES

Outlet, Device and Junction Boxes:

Boxes shall be galvanized steel boxes with knock-outs and shall be the size and configuration best suited to the application indicated on the plans. Minimum size of outlet, device, or junction boxes shall be 4 inches square by 1-1/2 inches deep. Flush-mounted single device and surface mounted light fixture boxes shall have four inch square single raised device covers.

Flush-mounted boxes shall have stainless steel covers, 0.04 inches thick. Surface-mounted boxes shall have galvanized steel covers with metal screws. Cover screws shall be metal with finish to match cover finish.

Sectional device plates will not be permitted.

Cast boxes and weatherproof boxes shall be cast iron boxes with threaded hubs in conformance with the requirements in NEMA FB-1, and shall be of the size and configuration best suited to the application shown on the plans. Minimum size of outlet, device, or junction boxes shall be 4 inches square by 1-7/8 inches deep.

Cast boxes and weatherproof boxes shall have cast iron covers with gaskets.

Weatherproof device boxes shall have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Communication Outlet Box, Speaker Outlet and Horn Outlet Box:

Communication outlet box, speaker outlet and horn outlet box shall be 4-inch square box with blank faceplate. Boxes on stud walls shall have raised device covers.

Pull Boxes:

Pull boxes shall be in conformance with the provisions in Section 86-2.06, "Pull Boxes," of the Standard Specifications.

Traffic rated pull boxes shall be in conformance with the provisions in Section 86-2.07, "Traffic Pull Boxes," of the Standard Specifications.

Electrical pull box covers and traffic rated pull box covers shall be marked "ELECTRICAL." Telephone pull box covers shall be marked "COMMUNICATION."

RECEPTACLES AND SWITCHES

Ground Fault Circuit Interrupter Receptacle, (GFCI): GFCI receptacle shall be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt, specification grade, duplex receptacle suitable for wiring with stranded conductors. Receptacle shall detect and trip at current leakage of 5 mA and shall have front mounted test and reset buttons.

Duplex Receptacle: Duplex receptacle shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt, ivory color, specification grade duplex receptacle suitable for wiring with stranded conductors.

Management Information System (MIS) Receptacle: MIS receptacle shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt, isolated ground, orange color, specification grade duplex receptacle suitable for wiring with stranded conductors.

Fourplex Receptacles: Fourplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Single Receptacles: Single receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Sump Pump Receptacles: Sump pump receptacles shall be 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, single, specification grade receptacle suitable for wiring with stranded conductors to match the plug of the sump pump unit provided.

A/C Unit Receptacles: A/C unit receptacles shall be 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, single, specification grade receptacle suitable for wiring with stranded conductors to match the plug of the air conditioning unit provided.

Reel Light Receptacle: Reel light receptacle shall be NEMA Type L5-20R, 3-wire, 20-ampere, 125-volt, twist-lock, single, specification grade receptacle suitable for wiring with stranded conductors.

Multioutlet Assemblies: Multioutlet assemblies shall be 3-wire, 15-ampere, 125-volt, 40-inch long strip, grounding type receptacles spaced 6 inches on center. The assembly shall be provided with the necessary entrance end fitting and blank end fitting.

Single Pole Switch: Single pole switch shall be 20-ampere, 120/277-volt, quiet type, specification grade, ivory color switch with silver alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Three-way Switch: Three-way switch shall be 20-ampere, 120/277-volt, quiet type, specification grade, ivory color switch with silver alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Four-way Switch: Four-way switch shall be 20-ampere, 120/277-volt, quiet type, specification grade, ivory color switch with silver alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Selector Switch, SS: Selector switch shall be rotary action, double-pole, 2-position, 10-ampere, 120-volt switch. Switch contacts shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switch shall have legend plate marked MANUAL-AUTO.

Timer Switch: Timer switch shall be a spring wound mechanical timer with a rotary dial. Contacts shall be rated 20 amperes at 120 volts. Time adjustments shall range from zero to two hours.

Digital Timer Switch: Digital timer switch shall be an electronic interval timer switch with a manually operated toggle switch or pushbutton. Switch shall be rated 1200-watt ballast at 120/277 volts. Time adjustments shall range from 5 minutes to 12 hours, initially set at 2 hours. Switch shall have an audible warning that beeps every 5 seconds at one minute prior to time out. The loads on the switch shall be turned off before the time-out setting expires by pressing the ON/OFF button. The switch shall also be reset anytime by holding the button for 2 seconds.

OCCUPANCY SENSOR SWITCHES

Wall Switch Occupancy Sensor, Type 1:

Wall switch occupancy sensor, Type 1 shall be a wall-mounted, single level, passive infrared sensor switch with time delay.

The switch shall be rated at 800 watts (minimum) incandescent or 1200-VA (minimum) fluorescent at 120 volts, operate on 120/277 volts and be installed in a device box with single raised device cover.

The switch shall be capable of manual on/automatic off mode.

The switch shall cover a minimum of 900 square feet of floor area, and have a field of view of not less than 180 degrees.

The switch shall be compatible with all electronic ballasts and have no leakage to load in the "OFF" mode.

The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes.

Wall Switch Occupancy Sensor, Type 2:

Wall switch occupancy sensor, Type 2 shall be a wall-mounted, bi-level, passive infrared dual relay sensor switch with time delay.

Primary relay shall be rated at 800 watts (minimum) incandescent or 1200 VA (minimum) fluorescent at 120 volts.

Secondary relay shall be rated at 800 watts (minimum) incandescent or 800 VA (minimum) fluorescent at 120 volts.

The relays in the sensor shall be capable of simultaneously controlling 2 different lighting loads or circuits. The second relay shall be independent allowing for two-circuit control.

Switch shall operate on 120/277 volts and be installed in a device box with single raised device cover.

The unit shall have dual manual override switches that can be used to toggle manual on/automatic off mode for each lighting load.

The switch shall cover a minimum of 1000 square feet of floor area, and have a field of view of not less than 180 degrees.

Switch shall be compatible with all electronic ballasts and have no leakage to load in the "OFF" mode.

The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes.

Light level adjustment shall be adjustable from 10 fc to 150 fc, initially set at 75 fc.

Switch shall have audible alert to indicate impending light shut off.

Ceiling Mounted Occupancy Sensor:

Ceiling mounted occupancy sensor shall be a low voltage, ultrasonic occupancy sensor switch with a 32 kHz frequency.

Switch shall operate on 24volts DC and shall include an independent power pack unit. Switch shall contain angled transmitter and receiver pairs.

The switch shall cover a minimum of 1100 square feet of floor area and have a field of view of not less than 360 degrees, conical pattern.

The switch shall have LED indicator that remains active at all times in order to verify detection within the area to be controlled.

Switch shall be compatible with all electronic ballasts and shall have no leakage to load in the "OFF" mode.

The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes.

Ceiling mounted occupancy sensor shall be supplied with power pack unit; a combination 24 volts DC power supply and 20 ampere line voltage relay. Power supply shall be a self-contained transformer with 24 volts DC and minimum 150 mA output. Input voltage to power pack unit shall be suitable for 120/277 volts. Relay shall be Class B insulating material and have a contact rating of 20 amperes at 120/277 volts. Power pack unit and occupancy sensor shall be from the same manufacturer. Power pack unit shall be mounted inside a junction box.

Corner Mounted Occupancy Sensor:

Corner mounted occupancy sensor shall be a low voltage, passive infrared occupancy sensor with dual element, temperature compensated pyroelectric sensor.

Switch shall operate on 24 volts DC and shall include an independent power pack unit.

The switch shall be suitable for corner mount and shall have a dense wide-angle lens.

The switch shall cover a minimum 2000 square feet of floor area.

The switch shall have LED indicator that remains active at all times in order to verify detection within the area to be controlled.

Switch shall be compatible with all electronic ballasts and shall have no leakage to load in the "OFF" mode.

The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes.

Corner mounted occupancy sensor shall be supplied with power pack unit; a combination 24 volts DC power supply and 20 ampere line voltage relay. Power supply shall be a self-contained transformer with 24 volts DC and minimum 150 mA output. Input voltage to power pack unit shall be suitable for 120/277 volts. Relay shall be Class B insulating material and have a contact rating of 20 amperes at 120/277 volts. Power pack unit and occupancy sensor shall be from the same manufacturer. Power pack unit shall be mounted inside a junction box.

Wall Mounted Occupancy Sensor:

Wall mounted occupancy sensor, shall be a low voltage, passive infrared (PIR) sensor switch. Switch shall have an adjustable time delay. Switch shall operate on 24 volt (dc) and shall be provided with a power pack unit. The sensor switch shall cover a minimum of 90 ft long by 16 ft wide when mounted at 10 ft high. The time delay off setting shall be adjustable from 30 seconds to 30 minutes, initially set at 10 minutes. Switch shall be provided with a swivel mounting bracket or a twist and lock base mounting hardware for fast alignments. Sensor shall be compatible with electronic ballasts.

Wall mounted occupancy sensor shall be supplied with power pack unit; a combination 24 volts DC power supply and 20 ampere line voltage relay. Power supply shall be a self-contained transformer with 24 volts DC and minimum 150 mA output. Input voltage to power pack unit shall be suitable for 120/277 volts. Relay shall be Class B insulating material and have a contact rating of 20 amperes at 120/277 volts. Power pack unit and occupancy sensor shall be from the same manufacturer. Power pack unit shall be mounted inside a junction box.

MISCELLANEOUS MATERIALS

Auxiliary Relay Pack: Auxiliary relay pack shall include an additional 20 ampere line voltage relay mounted inside a junction box. Relay shall be as specified in the occupancy sensor power pack unit.

Warning Tape: Warning tape shall be 4 inches wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 3/4-inch black letters at 30-inch intervals on bright orange or yellow background. The printed warning shall be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape shall have a tensile strength of not less than 155 pounds per 4-inch wide strip and shall have a minimum elongation of 700 percent before breaking.

Pull Rope: Pull rope shall be nylon or polypropylene with a minimum tensile strength of 1800 pounds.

Watertight Conduit Plug: Watertight conduit plug shall be a hollow or solid stem expansion plug complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances.

Anchorage Devices: Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, or expansion anchors as required by the supporting device.

Electrical Supporting Devices:

Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable iron.

Construction channel shall be 1-5/8 inches x 1-5/8 inches, 12-gage galvanized steel channel with 17/32-inch diameter bolt holes, 1-1/2 inches on center in the base of the channel.

Ground Rod: Ground rod shall be a 3/4-inch (minimum) galvanized or copper clad steel rod, 10 feet long, and shall conform to the requirements in NEMA GR-1.

PART 3 - EXECUTION

INSTALLATION

Conduit:

Conduits shall be installed as specified in Section 86-2.05C, "Installation," of the Standard Specifications and the following:

1. All conduits shall be rigid steel except as follows:

    a. EMT may be used in walls and furred spaces and for exposed work indoors above the switch height.
    b. Flexible metallic conduit shall be used to connect suspended lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.
    c. Liquidtight flexible metallic conduit shall be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet or exterior locations.
    d. PVC coated rigid steel conduit shall be used for base elbows and vertical risers through concrete slabs.
    e. Rigid non-metallic conduit shall be used in underground, exterior locations.
    f. PVC coated rigid steel conduit shall be used on all outdoor work shown as metal conduit on the plans.

2. Rigid non-metallic conduit bends of 30 degrees or greater shall be factory-made long radius sweeps. Bends less than 30 degrees shall be made using an approved heat box.
3. Locations of conduit runs shall be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.
4. Where practical, conduits shall be installed in groups of parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.
5. Exposed conduit shall be installed parallel and at right angles to the building lines.
6. Conduits shall not be placed closer than 12 inches from a parallel hot water or steam pipe or 3 inches from such lines crossing perpendicular to the runs.
7. All raceway systems shall be secured to the building structures using specified fasteners, clamps and hangers.
8. Single conduit runs shall be supported by one hole conduit clamps. Single conduit runs on walls in damp or wet locations shall be installed with clamp backs to space conduit off the surface.
9. Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.
10. Raceways of different types shall be joined using approved couplings or transition fittings.
11. Expansion couplings shall be installed where conduit crosses a building separation or expansion joint.
12. All floor and wall penetrations shall be sealed watertight.
13. Type 5 conduit shall not be used.

Conduit Terminations:

Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and insulating metallic bushing. EMT shall be securely fastened to cabinets, boxes and gutters using connectors. Conduit terminations at exposed weatherproof and cast boxes shall be made watertight using hubs.

Grounding bushings with bonding jumpers shall be installed on all conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

Rigid non-metallic conduit shall be terminated inside the underground pull boxes with an approved conduit bushing or fitting. All conduits shall enter vertically through the bottom of pull boxes.

All future conduits terminated in underground pull boxes or left exposed indoors and outdoors shall be provided with watertight conduit plugs.

Warning Tape: Warning tape shall be placed over each conduit in a trench. Each warning tape shall be centered over the conduit and shall be placed over the 6 inch layer of sand covering the conduit as specified elsewhere in these special provisions.

Conductor and Cable Installation:

Conductors shall not be installed in conduits until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors so that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

All cables shall be installed and tested in conformance with manufacturer's recommendations.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Six inches of slack shall be provided at each outlet and device connection. If the outlet or device is not at the end of a run of conductor, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

All pressure type connectors and lugs shall be retightened after the initial set.

Splices in underground pull boxes and similar locations shall conform to the provisions in Section 86-2.09C, "Connectors and Terminals," and Section 86-2.09E, "Splice Insulation," of the Standard Specifications.

Junction boxes in furred or accessible ceiling spaces shall be identified on the cover plate with permanent marking pen denoting the circuits contained in the box.

Conductor Identification:

The neutral and equipment grounding conductors shall be identified as follows:

1. Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white markers such as paint or white tape at each termination.
2. Equipment grounding conductor may be bare or insulated. Insulated equipment grounding conductors shall be green over its entire length. Isolated equipment grounding conductor shall be green with one or more yellow stripes over its entire length. Conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape at all accessible locations over the entire exposed conductor.

Ungrounded feeder and branch circuit conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

SYSTEM	COLOR CODE
120/208 volt-Three phase	Black, red, blue
277/480 volt-Three phase	Brown, purple, yellow

Once grounded and ungrounded insulated conductors are identified with a specific color code, that color code shall be used for the entire length of the circuit.

Where more than one branch circuit enters or leaves a conduit, panel, gutter, or junction box, each conductor shall be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices shall be identified at each

termination with the conductor numbers shown on the plans, working drawings, and as directed by the Engineer where deemed necessary. Identification shall be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Pre-printed, white, heat-shrinkable tubing.

The identifying numbers of the terminating conductors, as shown on the plans or the working drawings, shall be identified on the terminal block marking strip.

Outlet, Device and Junction Box Installation:

Where exposed rigid steel conduits are connected to an exposed outlet, device, or junction box at or below switch height, the box shall be a cast box.

All boxes shall be finished flush with building walls, ceiling and floors except where exposed work is called for.

Raised device covers shall be installed on all boxes concealed in concrete, masonry or stud walls.

No unused openings shall be left in any box. Knockout seals shall be installed to close openings.

Adjustments to locations of outlet, device and junction boxes may be made as required by structural conditions and to suit coordination requirements of other trades.

Boxes in stud walls and partitions shall not be mounted back to back. Through-wall boxes will not be allowed.

Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on heavy gauge galvanized steel, snap-in box supports.

Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted on 16-gage metal channel bars attached to main ceiling runners.

Fixture outlet boxes for pendant-mounted fixtures installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structures above.

Multiple switches shall be installed in standard boxes.

Pull Box Installation:

Pull box installation shall be in conformance with the provisions in Section 86-2.06C, "Installation and Use," of the Standard Specifications and the following:

Top of pull boxes shall be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus one inch above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

Occupancy Sensors Installation: Occupancy sensors shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location. Contractor shall provide all supports, hangers, spacers, channels, fasteners and all other necessary hardware to support the sensors. Final location of sensors shall be per manufacturer’s recommendations to provide best coverage for the application. All power packs and auxiliary relay packs shall be mounted inside an appropriately sized junction boxes or NEMA Type 1 enclosures. All splices or connections shall be made inside the junction box or enclosure. Ceiling mounted occupancy sensors shall be mounted in the ceiling with a flat unobtrusive appearance

Ground Rod Installation: Unless otherwise shown on the plans or specified in these special provisions, the ground rod shall be driven vertically until the top is 6 inches above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, approved by the Engineer, shall be installed.

Anchorages:

Hangers, brackets, conduit straps, supports, and electrical equipment shall be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices shall be installed in conformance with the anchorage manufacturer's recommendations.

Mounting heights: Electrical system components shall be mounted at the following mounting heights, unless otherwise shown on the plans. The mounting height dimensions shall be measured above the finished floor to the bottom of the device or component.

Thermostats	3’-10”
Wall switches	3’-4”
Convenience outlets	1’-6” in office areas 3'-4" in all other areas
Electric water cooler outlet	As recommended by the water cooler manufacturer.
Communication outlets	1’-6” in office areas 3'-4" in all other areas

12-16.03 INDOOR-OUTDOOR FIBER OPTIC CABLES

SUMMARY

Indoor-outdoor fiber optic cables must meet the requirements of one or more of:

1. TIA-492AAAA-A for multimode 62.5/125 Class 1a fibers

and the requirements of ICEA S-87-640 with deviations stated herein.

Cables shall be installed and tested in accordance with the requirements NECA/FOA-301 and TIA-568.

Fiber Characteristics

Dimensional characteristics: core diameter, core non-circularity, cladding diameter, core/cladding concentricity error, coating diameter, coating/cladding concentricity error

Mechanical characteristics: tensile strength, coating strip force

Optical characteristics: Attenuation coefficient, bandwidth length product (multimode fibers only), mode field diameter (singlemode fibers only), point discontinuity

Detail specifications for 62.5 µm core/125 µm cladding diameter Class Ia graded index multimode optical fibers as described by TIA-492AAAAXBBCD.

Property	FOTP(s)	Test conditions	Requirement	Units
Core diameter	58 with 29 or 43 or 44		62.5±3.0	µm
Core non-circularity	176		< 6	%
Cladding diameter µm	45 or 48 or 176		125±2.0	µm
Cladding non-circularity	45 or 48 or 176		< 2	%
core/cladding concentricity error	45 or 176		<3	µm
Coating diameter	55 or 163 or 173		250±15	µm
Coating/cladding concentricity error	55 or 163 or 173		< 20	µm
Tensile strength proof test	31		0.69	GPa
Coating strip force	178	30 mm length	1.0 min, 9.0 max	N
Attenuation coefficient	46 or 53 or 61	@ 850 nm	3.0	dB/km
	46 or 53 or 61	@ 1300 nm	0.9	
Bandwidth length product minimum	30 or 51	@ 850 nm	200	MHz·km
	30 or 51	@ 1300 nm	400	
Point discontinuity	59		<0.2	dB/pt

Cable Layup

Fiber optic cables include these components:

1. Color coded buffer tubes containing:

    1.1 Color coded coated fibers and one of the following filling materials

        1.1.1 Water blocking swellable polymer yarn or tape
        1.1.2 Water blocking granular or powder polymer

2. Filling material, one of the following

    2.1 Water blocking swellable polymer yarn or tape

3. Outer strength members.
4. Core wrap
5. Jacket

Cable Properties

Cables shall be tested in accordance with Parts 7 and 8 of ICEA S-104-696.

Part 7 "Cable testing, tests and requirements:"

Fibers of completed cables are tested at 1550 nm for singlemode fibers and 1300 nm for multimode fibers.

Metallic conductor components shall meet the requirements of ICEA S-104-696 except as agreed between the manufacturer and the user. Testing of metallic components shall meet the requirements of ASTM D 4566.

The following tests and requirements are provided by ICEA S-104-696:

Jacket stress crack resistance
Jacket tensile strength, yield strength and ultimate elongation
Cable and component dimensions (including ribbon measurements)
Ripcord function
Material compatibility and cable aging
Cable high and low temperature bend
Water penetration

Cable impact
Cable tensile loading and fiber strain
Cable compressive loading
Cable twist

Part 8 "finished cable optical performance requirements:"

The following tests and requirements are provided by ICEA S-104-696:

Attenuation coefficient
Point discontinuity
Multimode optical bandwidth
Singlemode cable cutoff wavelength

Identify and mark cables in accordance with Part 6 of ICEA S-104-696.

SPLICING

Make all splices by the fusion method. The average splice loss for singlemode splices must be less than 0.10 dB. The average splice loss for multimode splices must less than 0.12 dB.

TESTING

The following post splicing tests are provided by ICEA S-104-696:

End to end attenuation, using optical power meter and light source.
Optical anomalies by OTDR in both directions.

Full compensation for fiber optic cables is included in the contract price paid for building and no separate payment will be made therefor.

12-16.04 SERVICE AND DISTRIBUTION

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing service and distribution equipment in accordance with the requirements of the serving utilities, the details shown on the plans and these special provisions.

Related Work:

Permits, licenses, charges, fees and costs for arranging utility connections and extensions shall conform to the provisions in "Utility Connection," in Section 12-1, "General Requirements," of these special provisions.

Concrete and reinforcement for service and distribution equipment shall conform to the provisions in Section 12-3, "Concrete and Reinforcement," of these special provisions.

SUBMITTALS

Equipment Selection and Installation Details: The Contractor shall first select service and distribution equipment and other electrical equipment that will be part of the electrical system for performing system studies for short circuit coordination and arc flash hazard analysis. After all required equipment selection, perform a short circuit, coordination, protection and arc flash hazard study. While performing system study, every effort such as equipment selection to incorporate faster response time and proper selection of AC magnetic trip adjustment of all circuit breakers shall be considered so that Category of Hazard at any location under

consideration is either "0 or 1." Category of hazard greater than these values will be rejected The equipment selection and settings along with the study shall be submitted to the Engineer for approval. The study shall identify all non-standard settings and unusual components used for that equipment selection The Engineer will review and markup or approve the equipment selection and study within 15 days. The Contractor shall resubmit equipment selections and studies as needed until approved. No additional payment will be made for resubmittals.

When the equipment selection and short circuit, coordination, protection and arc flash hazard study has been approved submit complete service installation working drawings to the Engineer for approval. The Engineer will review and markup or approve the service installation working drawings within 15 days. The Contractor shall resubmit service installation working drawings as needed until approved. No additional payment will be made for resubmittals.

When these drawings have been reviewed and stamped "Approved" by the Engineer, the Contractor shall then submit the "Approved" copy of the service installation working drawings to the serving utility for their review and approval prior to installation.

Product Data:

A list of all materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials, front view and plan view of the assembly, assembly ratings and equipment specified herein. Assembly ratings shall include withstand and closing rating, voltage, continuous current and short circuit rating.

Working Drawings: Working drawings shall show the shape, size, and method of attachment for each component used in the work. Control and wiring diagrams shall include rough-in dimensions, component layout and conductor number identification.

Test Reports: Test results for service and distribution equipment shall be delivered to the Engineer within 3 business days of completion.

PART 2 - PRODUCTS

Service Equipment:

Service Equipment at the Commercial Vehicle Enforcement Facility (CVEF) shall be a main switchboard with provisions for utility company current transformer and metering section, fire pump service disconnect section, building service disconnect section, automatic transfer switch section and fire pump generator service section. Service equipment at the CVEF location shall be rated for 480/277-volt, 800-ampere, 3-phase, and 4-wire.

Enclosure shall be NEMA 3R enclosure. Exterior shall be 12-gage sheet steel. The interior shall be 14-gage sheet steel. All screws, latches, hasps, hinge pins and similar hardware shall be stainless steel. Exterior door shall be deadfront and lockable with a padlock. Circuit breaker shall be operable with the exterior door open and the interior door closed. Enclosure finish shall be baked enamel or baked thermosetting polyester finish.

Fire Pump Service disconnect switch shall be 3-pole, 480-volt, 600-ampere frame, 600-ampere trip, molded case circuit breaker with adjustable AC magnetic trip. The interrupting capacity of the circuit breaker shall be not less than 65,000 amperes (symmetrical) at 480 volts. Fire pump service disconnect switch shall be lockable in the "ON" position.

Surge protective device shall be Type 1, Category C device, designed for connection at the point of entry, suitable for 3-phase, 480 V application, conforming to current IEEE Standards

Building Service disconnect switch shall be 3-pole, 480-volt, 800-ampere frame, 800-ampere trip, molded case circuit breaker with adjustable AC magnetic trip. The interrupting capacity of the circuit breaker shall be not less than 65,000 amperes (symmetrical) at 480 volts.

Automatic Transfer Switch. Automatic transfer switches, ATS1 shall be for 480/277 V, 3-phase, 4-wire system using electrically operated, mechanically held device using two 3-pole molded case switches. ATS1 shall be rated at 800-ampere. Automatic transfer switch shall have an interrupting capacity of not less than 65,000 amperes (symmetrical) at 480 volts. The switch and all its components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL and NEMA as follows: UL 1008 (Transfer Switches), UL991 (Test for Safety Related Controls Employing Solid-State Devices), NFPA 110 (Emergency and Standby Power Systems), NEMA ICS 10 (AC Transfer Switch Equipment) and IEEE 446 (Recommended Practice for Emergency and Standby Power Systems). The switch shall utilize a microprocessor based controller. The controller shall provide the operator with an overview of the transfer switch status, parameters and diagnostic data. The controller shall be listed under UL Standard 1008.

The transfer switch shall meet the following requirements:

Compatible with standby generator provided in the project;
Microprocessor based controller;
Time delay normal to emergency (adjustable 0-1800 seconds); Factory set at 300 seconds
Time delay engine start (adjustable 0-120 seconds);Factory set at 60 seconds
Time delay emergency to normal (adjustable 0-1800 seconds) Factory set at 300 seconds
Emergency source sensing –phase reversal, under voltage;
Pilot lights – normal position, emergency position;
Auxiliary contacts-emergency source available;
Automatic plant exerciser with Load/No Load conditions;
Normal source sensing (phase reversal, undervoltage, under frequency);
Emergency source three phase voltage unbalance/loss;
Rated for 100 per cent equipment rating for continuous duty;
All phase under voltage/under frequency protection;
Position indicating contacts (normal and emergency);
LED indicators (source available/tripped);
Pushbutton test switches;
Pretransfer signal contacts (1NO/1NC)
Maintenance selector switch
2006 IBC/2007 CBC Seismic qualified.
Time delay relay (for connection to ATS2)

ATS1 shall be provided with controls such that ATS2 shall have first priority to transfer in case the fire alarm control panel detects the presence of fire. ATS1 shall transfer only after the fire pump has reached full load amperes.

SOURCE TESTING

Prior to shipping, the Manufacturer shall test the assembled service and distribution equipment for proper operation.

PART 3 - EXECUTION

Foundation for service equipment shall be as shown on the plans.

Installation of service equipment shall be in accordance with the requirements of the service utilities as shown on the approved installation details. Structure installation shall be 2006 IBC/2007 CBC seismic qualified. The Contractor shall provide equipment anchorage details coordinated with the equipment mounting provisions, prepared and stamped by a licensed civil engineer.

12-16.05 SYSTEM STUDIES AND FIELD TESTING

PART 1 – GENERAL

Scope: The following systems studies and field testing work will be performed by independent firms hired and paid by the Contractor. The Contractor shall cooperate with these independent firms as required to accomplish the work. The work will include furnishing labor and material to perform the following tasks:

Assist and guide the electrical equipment supplier in selecting the electrical equipment with correct characteristics that are suited for the system under consideration as specified in these special provisions.

Engineering services for the electrical systems studies including short-circuit analysis and protective device coordination;

Electrical Arc Flash Hazard Calculations and Analysis, Personnel Protective Equipment (PPE) and Clothing, and Arc Flash Hazard Training;

Independent field protective device setting and testing services for all electrical equipment and systems; and

Commissioning assistance for final coordinated systems.

SHORT-CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDIES

Short-circuit and protective device coordination will include the following:

Complete single-line diagram of system studied with all buses identified to report data;

Utility company maximum expected three-phase fault with X/R ratio and utility company maximum expected single-line to ground fault currents with X/R ratio at incoming supply location indicated shall be used in short circuit studies.

Short-circuit study including three phase and line to ground short-circuit currents at major buses extended down to system buses. Relay settings and protection device coordination studies shall include:

1. Coordinated composite time-current characteristic curves including recommended ratings and settings of all protective devices in tabulated form; and associated calculations to demonstrate that the power system protection will be selectively coordinated by the use of devices or equipment submitted.
2. Situations where system coordination is not achievable due to device limitations along with inadequate interrupting ratings will be noted.
3. The studies will consider operation during normal conditions, alternate operations, and during emergency power conditions, and will include ground fault protective device settings.
4. A registered Electrical Engineer in the State of California shall perform these studies.
5. Settings of main breaker relays on both incoming supply feeders from Southern California Edison shall be coordinated and approved by Southern California Edison.

Data consisting of manufacturer's time-current characteristic curves for individual protective devices, recommended settings of adjustable protective devices, and recommended ratings of non-adjustable protective devices.

The power systems study will be required within 30 days after contract approval for review and approval by the Engineer. The electrical submittals will be reviewed but will not be approved until the power systems studies have been received, reviewed, and approved by the Engineer as specified elsewhere in these special provisions.

ELECTRICAL ARC FLASH HAZARD ANALYSIS, WORKING LABELS AND TRAINING

Work shall be complete in the form of technical reports, PPE recommendations, relay coordination properly adjusted based upon the arc flash hazard analysis and training.

As a minimum the work shall include the following:

1. Electrical Arc Flash Hazard Calculation and Analysis. This includes reviewing tripping time of the protective devices and associated arc energy during arc fault. Electrical equipment selection shall be made so that Category of Hazard at any place except at the service equipment is either Category 1 or under. Any recommendations for equipment modifications or replacement of tripping devices inside the electrical distribution system shall be made as required to achieve the goal of keeping Category of Hazard at Category 1 or under.
2. Electrical equipment warning labels based upon the arc hazard energy. Labels shall comply with the requirements of NEC NFPA 70.
3. Arc Flash Hazard Training by a qualified professional in the field of electric arc hazard with a minimum of three (3) years experience in providing training classes and providing appropriate class room material. Training will be conducted in Oakland, Caltrans District 4 offices and a class of 25 individuals is expected for the training.
4. Instructor will make one site trip to the site and will show how to make use of personnel protective clothing recommended by the arc flash hazard study.

Software program such as SKM, EDSA, EasyPower, etc. shall be used in conducting arc flash hazard study. Before finalizing the study analysis provide a draft copy to the Engineer for reviews and approval.

SUBMITTALS

Comprehensive report that includes:

Report summary with analysis methology, findings and recommendations

Summary of input data for Utility source, equipment and cables

Available fault at each equipment location with comparison to equipment rating

Overcurrent device settings (e.g. pick-up, time delay, curve)

Incident energy level (calories/cm^2) for each equipment location and PPE

Overcurrent device coordination curves including related section of the single line diagram

Working Labels in accordance with ANSI Z535.4 -2002 which will include as a minimum the following:

Arc hazard boundary, Working distance, Arc flash incident energy at the working distance, PPE category and description of glove rating, Voltage rating of the equipment, Limited approach distance, Prohibitive approach distance, Equipment/bus name, Date prepared, Arc Flash hazard study prepare name and address.

ENGINEER'S QUALIFICATIONS

The power systems studies shall be performed by a registered Professional Engineer with at least five years of current experience in the design of coordinated power system protection and Arc flash hazard calculations and analysis. Experience data shall include at least five references for work of a magnitude comparable to this contract.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

SYSTEMS COMMISSIONING ASSISTANCE

A qualified equipment manufacturer representative shall affix all labels, make all field adjustment of all overcurrent protective devices and set all settings at the recommended settings in the presence of the Engineer.

QUALITY ASSURANCE

The short circuit and coordination studies will be performed in accordance with applicable ANSI and IEEE Standards. Field testing will be performed per NETA ATS specifications, manufacturer's recommendations, and these special provisions.

The Electrical Arc Flash Hazard will be performed in accordance with NFPA 70, NFPA 70E, OSHA 29 CFR, IEEE 1584 and IEEE 1584a.

PART 4 – MEASUREMENT AND PAYMENT

Full compensation for system studies and field testing shall be considered as included in the contract lump sum prices paid for building and no additional compensation will be allowed therefor.

12-16.06 ELECTRICAL EQUIPMENT

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing panelboards, integrated facilities switchboard, motor control center, starters, disconnect switches, transformers, and related accessories in conformance with the details shown on the plans and these special provisions.

Related Work: Anchorage devices shall be as specified under "Basic Materials and Methods" elsewhere in Section 12-16.

SUBMITTALS

Equipment Selection Details: The Contractor shall first select electrical equipment that will be part of the electrical system for performing system studies for short circuit coordination and arc flash hazard analysis. After all required equipment selection, perform a short circuit, coordination, protection and arc flash hazard study. While performing system study, every effort such as equipment selection to incorporate faster response time and proper selection of AC magnetic trip adjustment of all circuit breakers shall be considered and put into practice so that Category of Hazard at any location under consideration is either "0 or 1". Category of hazard greater than these values will be rejected The equipment selection and settings along with the study shall be submitted to the Engineer for approval. The study shall identify all non-standard settings and unusual components used for that equipment selection The Engineer will review and markup or approve the equipment selection and study within 15 days. The Contractor shall resubmit equipment selections and studies as needed until approved. No additional payment will be made for resubmittals.

When the equipment selection and short circuit, coordination, protection and arc flash hazard study has been approved submit complete working drawings to the Engineer for approval. No additional payment will be made for resubmittals.

Product Data:

A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the shop drawings shall be identified with wire numbers.

PART 2 - PRODUCTS

PANELBOARDS

Panelboard: Panelboard shall be indoor type, factory assembled, AC panelboard at least 20 inches wide with hinged door and molded case circuit breakers as shown on the plans. Panelboards shall be designed and tested in accordance with UL 67 (Panelboards), UL 50 (Cabinets and Boxes), and NEMA PB1 (Panelboards). Ratings shall be as shown on the plans. Panelboards shall have door-in-door trims. Both hinged trim and trim door shall utilize a 3-point latching. Main bus shall be copper. Bus sizing shall be based on NEMA standard temperature rise criteria of 65ºC over a 40ºC ambient (outside temperature). Panelboards shall have fullsize (100 percent) insulated groundable neutrals. Panelboards shall be Eaton/Cutler Hammer Company, Square D Company, or equal.

INTEGRATED FACILITES SWITCHBOARDS

Integrated Facilities Switchboard. Integrated facilities switchboard shall be a free standing dead front type distribution switchboard utilizing group mounted protective devices, integrated panelboards, transformers and other equipment as shown on the plans. The integrated facilities switchboard shall be designed, manufactured and tested in accordance with NEMA PB-2 and UL Standard 891. Switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Adequate ventilation shall be provided within the enclosure. All sections of the switchboard shall be rear aligned as shown on the plans. All protective devices shall be group mounted. Devices shall be front removable and load connections from accessible enabling switchboards to be mounted against a wall. All bus bars shall be silver-plated copper. A copper ground bus (minimum ¼ by 2 inch) shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard. All hardware used on conductors shall be high-tensile strength and zinc plated. All bus joints shall be provided with conical spring-type washers. Feeders in between units shall be copper.

MOTOR CONTROL CENTER

Motor control center, MCC, shall consist of enclosed vertical sections joined together to form a rigid free standing assembly. The motor control center shall be designed, manufactured and tested in accordance with NEMA ICS-2-322 and UL Standard 845. The MCC shall be constructed in accordance with NEMA standards for Type 1 gasketed enclosure. MCC shall be suitable for operation with 480 V, 3-phase, 4-wire plus ground and 60 hertz system inclusive of all components and devices as shown on the plans. MCC shall have a minimum fault interrupting capacity of not less than 35,00 amperes (symmetrical) at 480-volts. Vertical sections shall support the vertical buses, circuit breakers, combination starters, and control transformers, covers and doors and shall be designed for easy rearrangement of units. Base channels shall be provided with holes to permit bolting the MCC to the floor. Vertical sections shall be mounted with both horizontal and vertical wireways. Sufficient clearance shall be provided in the horizontal wireway so that no restriction is encountered in running wires from vertical to horizontal wire way.

SURGE PROTECTIVE DEVICES

Surge protective device shall be Type 2, Category B device, designed for connection at the sub panel, suitable for 3-phase, 480 V application, conforming to current IEEE Standards.

STARTERS

Air Compressor Combination Starter: Air compressor combination starter shall be combination 3-pole, 208-volt, NEMA Size 1, NEMA rated, line voltage starter and motor circuit protector in a NEMA-1 enclosure. Air compressor starter shall have two, 2-ampere, dual element, 250-volt fuses with 2-pole barrier type fuse base; 208-volt coil, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Reset button shall be externally operable.

Exhaust Fan Starter: Exhaust fan starters, ST1, ST2, ST3 and ST4, shall be combination 3-pole, 480-volt, NEMA Size 0, NEMA rated, line voltage starter and motor circuit protector mounted in the motor control center. Starter shall have 277-volt coil, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer.

Supply Fan Starter: Supply fan starter, ST5, shall be combination 3-pole, 480-volt, NEMA Size 0, NEMA rated, line voltage starter and motor circuit protector mounted in the motor control center. Starter shall have 277-volt coil, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer.

Evaporative Cooler Combination Starter: Evaporative cooler combination starter shall be combination 3-pole, 208-volt, NEMA Size 0, NEMA rated, line voltage starter in a NEMA 3R enclosure. Starter shall have 120-volt coil, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starter shall be provided with a dual element fuse to suit the circulating pump of the evaporative cooler system.

Declassification Fan Starter: Declassification fan starters, ST6 and ST7, shall be 3-pole, 208-volt, NEMA Size 0, NEMA rated, line voltage starters mounted inside the declassification fans control panel. Starter shall have 120-volt coil, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starter shall have one normally open auxiliary contact.

Manual Motor Starter: Manual motor starter shall be single-pole, 120-volt, 1 HP rated, manual motor starter with toggle type operator in a NEMA-1 enclosure complete with thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer.

SWITCHES

Fire Pump Controller and Automatic Transfer Switch combination. Fire pump controller and automatic transfer switch combination, ATS2, shall be as specified under "Fire Pump System" in these special provisions.

Combination Heating/Cooling Disconnect Switch: Combination heating/cooling disconnect switch shall be 3-pole, 600-volt, AC, 60-ampere, fusible, heavy duty safety switch in a NEMA Type-3R enclosure with provision for padlocking in the "OFF" position. Fuses shall be sized to suit the combination heating/cooling unit furnished.

Heat Pump Outdoor Unit Disconnect Switch: Heat pump outdoor unit disconnect switch shall be 3-pole, 240-volt, AC, 30-ampere, fusible, heavy duty safety switch in a NEMA Type-3R enclosure with provision for padlocking in the "OFF" position. Fuses shall be sized to suit the heat pump outdoor unit furnished.

Heat Pump Indoor Disconnect Switch: Heat pump indoor disconnect switch shall be 3-pole, 600-volt, AC, 60-ampere, fusible, heavy duty safety switch in a NEMA Type-1 enclosure with provision for padlocking in the "OFF" position. Fuses shall be sized to suit the auxiliary heater furnished as part of the heat pump unit.

Traffic Signal Disconnect Switch: Traffic signal disconnect switch shall be single-pole, 120/277-volt, AC, 20-ampere, snap switch in a two-gang cast metal box with cover.

CVEF Well House Disconnect Switch: Well house disconnect switch shall be 3-pole, 240-volt, AC, 30-ampere, molded case circuit breaker in a NEMA Type-1 enclosure with provision for padlocking in the "OFF" position. Well house disconnect switch shall be listed as suitable for service equipment.

CVEF Outdoor Condensing Unit Disconnect Switches: Outdoor condensing unit Disconnect switch OCU1 thru 3 shall be 3-pole, 600-volt, AC, 60-ampere, fused, heavy duty safety switch in a NEMA Type-3R enclosure. The fuses shall be sized to suit the outdoor condensing unit furnished.

Roll-up Door Disconnect Switch: Roll-up door operator disconnect switch shall be 2-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA Type -1 enclosure with provision for padlocking in the "OFF" position.

Rapid Roll-up Door Operator Disconnect Switch: Rapid Roll-up door operator disconnect switch shall be 3-pole, 600-volt, AC, 30-ampere, non-fusible, heavy duty safety switch in a NEMA Type -1 enclosure with provision for padlocking in the "OFF" position.

Exhaust Fan Disconnect Switch: Exhaust fan disconnect switch shall be 3-pole, 600-volt, 30-ampere, non-fusible, heavy duty safety switch in a NEMA Type-3R enclosure with provision for padlocking in the "OFF" position .

Exhaust Evacuation System Disconnect: Exhaust evacuation: system disconnect shall be a single-pole, 120-volt, 1 HP rated manual motor starter with toggle type operator in a NEMA Type-1 enclosure complete with thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer.

Pit Cover Drive Motor Disconnect Switch: Pit cover drive motor disconnect switch shall be 3-pole, 600-volt, AC, 30-ampere, non-fusible, heavy duty safety switch in a NEMA Type-3R enclosure with provision for padlocking in the "OFF" position.

Radiant Heater Disconnect Switch: Radiant disconnect switch shall be 2-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA Type-1 enclosure with provision for padlocking in the "OFF" position.

Weigh Station Bypass (WSB) Power Disconnect Switch: WSB power disconnect switch shall be single-pole, 120-volt, AC, 20-ampere, molded case circuit breaker in a NEMA Type -3R enclosure with provision for padlocking in the "OFF" position.

Indoor Unit Disconnect Switch: Indoor unit disconnect switch at the Communication Hub Building shall be 2-pole, 240-volt, AC, 30-ampere, fusible, general duty safety switch in a NEMA Type-1 enclosure with provision for padlocking in the "OFF" position. The fuses shall be sized to suit the indoor unit furnished.

Outdoor Unit Disconnect Switch: Outdoor unit disconnect switch at the Communication Hub Building shall be 2-pole, 240-volt, AC, 30-ampere, fusible, general duty safety switch in a NEMA Type-3R enclosure with provision for padlocking in the "OFF" position. The fuses shall be sized to suit the outdoor unit furnished.

TRANSFORMER

Transformer: Transformer shall be indoor, energy efficient, dry type, general purpose, 3-phase, 480-volt primary, 120/208-volt secondary, transformer. Transformer shall have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary voltage. Transformer shall have copper windings and rated 150ºC rise. KVA rating shall be as shown on the plans. Transformers RT shall be indoor type and floor mounted. Transformer TT shall be mounted inside the integrated facilities switchboard.

MISCELLANEOUS MATERIALS

Declassification Fans Control Panel: Declassification fans control panel shall be a single hinged door dustight NEMA 12 enclosure containing an electrical mounting panel and door clamps. The panel shall be factory prewired in conformance with NEMA Class II, Type C wiring. The following components shall be mounted on

the door: Start/Stop pushbuttons; and Pilot light, PL. The following components shall be mounted on the electrical mounting panel: Motor disconnects, MD1 and MD2; Declassification Fans Starters, ST6 and ST7; and terminal block, TB.

Motor Disconnect: Motor disconnects, MD1 and MD2, shall be 3-pole, 240 volt molded case circuit breakers with trip ratings as shown on the plans. Motor disconnects shall be mounted in the declassification fans control panel.

Terminal Block: Terminal block shall be 30 A, 300 V, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electrical potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

Start/Stop Pushbutton: Declassification fans pushbutton shall be "start-stop" heavy duty oil-tight two-button station mounted on the hinged door of the declassification fans control panel. The contact shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

Pilot Light: Pilot light shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with green domed cap.

Programmable Timer Switch: Programmable timer switch shall be 120-volt, AC, digital timer switch control with on-off and manual override. Timer switch shall be able to be programmed for a minimum of 2 independent schedules for any day of the week, in addition to being able to skip selected days. Unless otherwise noted, programmable timer switch shall have a minimum of two channels with 2 single pole, double-throw normally open contacts rated at not less than 16 amperes at 120-volt, AC. Programmable timer switch shall have a non-volatile memory that requires no backup. Initially set each channel so that each channel will be alternately closed for 8 hours.

Warning Sign: Warning sign shall be sheet steel, not less than 18-gage with a baked enamel coating and shall have red letters, 2 inches in height, on a white background.

Nameplates: Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capitals letters etched through the outer layer of the nameplate material.

Warning Plates: Warning plates shall be laminated phenolic plastic with white core and red front and back. Warning plates inscription shall be in capital letters etched through the outer layer of the nameplate material.

Plywood Backing Board: Plywood backing board for mounting electrical or telephone equipment shall be ¾-inch, APA plywood panels, C-D PLUGGED and touch-sanded, Exposure 1.

Air Resources Board Pedestal Enclosure: Air resources board pedestal enclosure shall be single exterior hinged door, dust tight NEMA Type 3R enclosure containing and electrical mounting panel. The enclosure shall be made of 14-gauge steel minimum with all seams continuously welded. A rolled lip shall be provided around three sides of the hinged door and around all sides of the opening. The door shall be provided with a neoprene gasket that is attached with an oil-resistant adhesive. The door shall be maintained closed with door clamps. Security shall be provided by a hasp and staple for padlocking. Enclosure shall be provide with an interior mounting panel with a weatherproof ARB telephone outlet and weatherproof ARB receptacle. Telephone outlet shall be a communication outlet with one telephone jack. Receptacle outlet shall be a 30-ampere, 2-pole, 3-wire, grounding type, 125-volt, AC, outlet conforming to the configuration shown in figure 551-46(c) of the National Electrical Code

PART 3 - EXECUTION

INSTALLATION

Plywood Backing Board:

Plywood backing board shall be securely fastened to walls or other vertical framing.

Surface to be coated shall be cleaned of all dirt, excess materials, and filler by hand cleaning.

Exposed surfaces of plywood backing board shall be coated in conformance with the provisions in "Wood, Painted" specified under Section 12-9 "Painting," of these special provisions. The color shall match surrounding surfaces, or shall be as directed by the Engineer.

Coatings shall be applied in conformance with the manufacturer′s instructions. Each coat shall be applied to a uniform finish, free of skips, brush marks, laps or other imperfections.

Panelboard Installation:

Set cabinets plumb and symmetrical with building lines. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.

Mounting height shall be 5½ feet to the highest circuit breaker handle, measured above the finished floor.

Provide three ¾-inch empty conduit from flush panelboard enclosure to a point above furred ceiling for each 16 circuits or fraction thereof in each panelboard.

Where "Space" is indicated on the plans, branch connectors, mounting brackets, and other hardware shall be furnished and installed for future breaker.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

Transformer Installation: Connect primary to minimum value taps during construction period and prior to initial building start-up. Make voltage readings and adjust tap connections to nominal voltage during final construction review and prior to building occupancy. Install conduit connections that will prevent transmission of the transformer vibrations to the conduit system. Transformers shall be bolted to floor when floor mounted and bolted to wall with support brackets when wall mounted. Pad mounted transformers (unit substation) shall be installed as shown on the plans.

Surge protective devices of the Type B shall be installed at location shown on the plans.

Equipment Identification:

Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions shall be ¼-inch high letters and shall read as follows:

1. Inscriptions for panelboards and switchboards shall include designation, voltage, amperes and phase of supply and shall read in the following example: PANEL C, 120/208 V, 100 A, 3-PHASE, 4-wire.

2. Inscriptions for disconnect switches shall be the respective device it is controlling and shall read in the following example: OVERHEAD DOOR

3. Inscription for control panels or stations shall be the panel or station designation as shown on the plans and shall read in the following example: DECLASSIFICATION FANS CONTROL PANEL.

Warning Sign: Warning sign with the message shall be fastened to the wall near the declassification fans control panel with at least 6 anchorage devices.

12-16.07 LIGHTING

PART 1 – GENERAL

Scope: This work shall consist of furnishing, installing and connecting all lighting equipment in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval. Wiring diagrams and component layout for the lighting control stations shall be provided.

PART 2 – PRODUCTS

Lighting Fixture Lamps: Lighting fixture lamps shall be type and size as shown on the plans. Lamps shall be General Electric, Phillips, Sylvania, or equal. Fluorescent lamps, unless otherwise noted, shall be 4100K tri-phosphor with a CRI of 70 or greater.

Ballasts: All fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by the fixture. Fluorescent ballasts shall be UL Listed, Class P and ETL Certified ballasts with sound rating A. Fluorescent ballasts shall be high-frequency electronic ballasts with power factor greater then 0.95, nominal ballast factor of 0.88 unless specified otherwise, total harmonic distortion less than 20 percent, crest factor less than or equal to 1.7, complying with ANSI C 62.41 Category A for surge protection, and FCC Part 18 for interference. Dimming ballasts shall be high frequency ballasts as specified above and shall be capable of dimming the light output from 100 percent to 20 percent of the rated light output.

Lighting Fixtures: Lighting fixtures shall be as shown on the plans and as specified herein. Outdoor luminaires shall be listed and labeled "Fixture Suitable For Wet Locations."

Traffic Signals. Traffic signals shall be as specified under "Vehicle Monitoring and Signal System" in these special provisions.

High Mast Lighting Assembly. High mast lighting assembly shall be as specified under "High Mast Lighting Assembly" in these special provisions.

Sign Lighting. Sign Lighting shall be as specified under "Sign Lighting-Fluorescent" in these special provisions.

Fused Splice Connector: Fused splice connectors shall be Buss, Elastimold; or equal; with standard midget, ferrule, 5-ampere, 480-volt, slow blowing fuses. The connectors shall be designed so that both ungrounded conductors are disconnected simultaneously.

Photoelectric Unit, PEU: Photoelectric unit shall be cadmium sulfide photoelectric control with capacity of 1000-watt incandescent or 1800-watt inductive or fluorescent load, mounting adapter, and EEI-NEMA twist lock receptacle; Fisher-Pierce, Ripley, or equal.

Lighting Control Station, LCS: All lighting control stations shall consist of lighting contactors, time clock, bypass timer switches, disconnect switch, terminal block and pilot light in a surface mounted NEMA-12 enclosure with a hinged door. All components and their ratings for the lighting control stations shall be as shown on the plans.

Disconnect Switch: Disconnect switch shall be a 30-ampere, 3-pole nonfusible switch with a flange mounted handle.

Lighting Contactor, LC: Lighting contactor shall be electrically held, combination lighting contactor with 277-volt AC coil and 30-ampere, double-break, silver alloy contacts; Square D Company, I.T.E., Cutler Hammer, or equal. Number of poles shall be as shown on the plans.

Bypass Timer Switch: Bypass timer switch shall be , 10-ampere, 277-volt switch, single pole, spring would, mechanical timer switch that requires no electricity to operate. Switch shall have a 2-hour maximum range without a hold position.

Timer Clock: Time clock shall be a 277-volt, AC, astronomical time switch control device with power on-off and manual override. Time clock shall be able to be programmed for a minimum of 2 independent schedules for any days of the week, in addition to being able to skip selected days. Unless otherwise noted, time clock shall have minimum 2 single-pole, double-throw normally open contacts shall be rated at not less than 20 amperes at 277-volt, AC. Time clock shall have a non-volatile memory that requires no backup.

Pilot Light, PL: Pilot light shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with red domed cap.

Terminal Block, TB: Terminal block shall be 30-ampere, 300-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electrical potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

FABRICATION

Component Mounting: Lighting control stations shall be factory pre-wired control panels in accordance with NEMA ICS 18, Class II, Type C wiring. Selector switches, pilot lights and bypass timer switches shall be mounted on the hinged doors of lighting control stations. Wiring of control panel with gray color insulation conductors shall be prohibited. Unless otherwise noted, all other components shall be mounted on the back panel. The door shall open only when the disconnect switch is in the "OFF" position.

PART 3 - EXECUTION

Lighting Fixtures:

Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

Ballasts:

All fluorescent fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by fixture. The Contractor has the option to install low voltage dimming control provided that the Contractor submit plans and specifications with appropriate revisions for the low voltage dimming control to the Engineers for approval prior to installation.

All ballasts used in unheated areas inside the building shall be 0°F ballasts or less.

Pole Mounted Luminaires:

In the pull box adjacent to each pole for luminaire, H1, a fused splice connector shall be installed in each ungrounded conductor between the line and the ballast. The connector shall be readily accessible in the pull box and shall be insulated and made waterproof in accordance with the splice connector manufacturer's recommendations.

12-16.08 STANDBY GENERATOR

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing a standby generator in accordance with the details shown on the plans and these special provisions.

The standby generator shall be factory assembled standby generator assembly and shall include such other miscellaneous accessories, not mentioned, which are required for the complete installation and proper operation of the standby generator.

The standby generator assembly shall be supplied with warning sign, battery hydrometer with storage container, battery filler, distilled water, anchoring devices and vibration isolators that are required for the complete installation.

Attention is directed to "Service and Distribution" and "Automatic Fire Protection System" in these special provisions regarding the transfer switches connected to the standby generator.

PERMIT REQUIREMENTS

The Contractor shall make all arrangements and obtain all permits and licenses required for the operation of the standby generator applicable to this project.

Generator exhaust shall conform to the rules for control of emissions adopted by the air quality control district in the air basin in which the standby generator is installed.

Full compensation for any costs incurred by the Contractor to obtain the permits and licenses shall be considered as included in the contract lump sum price paid for building work, and no additional compensation will be allowed therefor.

SUBMITTAL

Product Data:

A list of all materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Manufacturer's descriptive data shall include catalog cuts, complete description, performance data and installation instructions.

Working Drawings:

Working drawings shall be submitted for approval. Working drawings shall show the shape, size, and method of attachment for each component used in the work. Control and wiring diagrams shall include rough-in dimensions, component layout, and conductor number identification.

Closeout Submittals:

Prior to the completion of the contract, 3 identified copies of the operation and maintenance manual and one CD with PDF files of the manual pages shall be delivered to the engineer at the jobsite. The instructions and parts list shall be in a bound manual form and shall be complete and adequate for all equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals and CDs at no additional expense to the State.

Quality Assurance:

The control panel and its components shall conform with the requirements in applicable NEMA standards.

PART 2 – PRODUCTS

Standby-Generator Assembly:

The standby generator assembly shall consist of a skid mounted, diesel fueled engine, generator, base mounted fuel tank, starting batteries, standby generator control panel, battery charger, outdoor type protective housing, exhaust system, engine water jacket heater, fuel regulator, and generator disconnect. The engine generator set shall be factory enclosed in a heavy gauge steel enclosure constructed with 14 gauge corner posts, uprights and headers. The roof shall be made of aluminum, aid in the runoff of water and include a drip edge. The enclosure shall be coated with electrostatically applied powder paint, baked and finished to manufacturer's specifications. The enclosure is to have large, hinged doors to allow access to the engine, alternator, and control panel.

Engine:

The engine shall be 4-cycle, turbocharged, diesel fuel type with not less than 912 cubic inches of piston displacement, liquid cooled, and designed for continuous operation. The engine shall deliver a minimum of 750 brake horsepower at 1800 RPM.

The engine's continuous duty rated output shall be ample to drive the generator and connected normal accessories at the rated speed and unity power factor at 100 percent of the rated load with an ambient temperature of 95°F at 2900 feet above sea level. The engine be cooled with a unit mounted radiator, fan with fan guard, water pump, and closed coolant recovery system providing visual diagnostic means to determine if the system is operating with a normal engine coolant level. The intake air filter(s) with replaceable element must be mounted on the unit. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have replaceable oil filter(s) with internal bypass and replaceable element(s). Engine coolant and oil drain extensions, equipped with pipe plugs, must be provided outside the mounting base. The engine shall have a unit mounted, thermostatically controlled water jacket heater to aid in quick starting. The wattage shall be as recommended by the manufacturer. The Contractor shall provide proper branch circuit from normal utility power source. The engine shall have sensing elements for low oil pressure shutdown, high coolant temperature shutdown, low coolant level shutdown, overspeed shutdown and overcrank shutdown.

The engine shall operate satisfactorily on commercial grade No. 2-D diesel fuel. The crankshaft shall be drilled for full pressure lubrication to all bearings. All crankshaft bearing surfaces shall be hardened. The crankshaft shall have one more main bearing than there are number of cylinders. The intake and exhaust valves and valve seats shall be heat resistant alloy steel. The exposed surfaces of the engine shall be finished with one coat of primer and 2 coats of an industrial paint suitable for the intended use.

The engine shall be equipped with the following accessories:

Diesel Fuel Filter System: The diesel fuel filter system shall consist of a primary fuel filter capable of removing particles of 50 microns and larger, and a secondary filter capable of removing particles of 25 microns and larger. Each filter shall be a spin-on, replaceable unit, designed for diesel fuel filtration and water separation. Filters shall be located for easy service access.

Oil Filter System: The pressurized lubricating oil system shall have a full flow filter system, consisting of a strainer and a separate, cleanable or replaceable filter capable of removing particles of 25 microns and larger.

Air Filter System: The air intake shall be provided with a dry type air filter of adequate capacity to effectively remove dirt and abrasives from the combustion air. The dry type filter shall be designed to allow for easy removal and replacement of filter element. The filter shall be equipped with service indicators to indicate necessary replacement.

Engine Governor: Engine speed shall be controlled by isochronous governor with no change in alternator frequency from no load to full load. Steady state regulation is to be 0.25%.

Engine Cooling: The engine shall be equipped with an engine driven radiator cooling system. The radiator shall be capable of cooling the engine while operating at 100 percent rated continuous load in 122°F maximum ambient temperature. Fan shall be push type.

Engine Preheater: The engine shall be equipped with a 208-volt, 3000-watt electric water jacket heater supplied and preinstalled by the standby generator manufacturer. The heater shall be thermostatically controlled to maintain engine coolant at the proper temperature to meet the manufacturer's start up requirement. The required electrical wiring shall be factory installed. Controls shall be provided to shut down the engine preheater during start-up and while the standby generator is running.

Engine Starter: The engine shall be provided with a 12-volt heavy duty positive engagement solenoid shift starting motor. The drive mechanism for engaging the starting motor with the engine flywheel shall engage and release without binding.

Safety Controls:

The engine shall be provided with automatic controls that shut down engine operation when low lubricating oil pressure, high water temperature or overspeed conditions occur. The values at which the low lubricating oil pressure, high water temperature and overspeed controls operate to shut down engine operation, shall be as recommended by the engine manufacturer.

Upon failure of primary power, the engine shall automatically crank for 20 seconds or until it starts, whichever is shorter. If the engine fails to start within 20 seconds, further attempts to start shall be prevented by a manually reset lockout device. Overcranking default condition shall be indicated by a pilot light on the control panel

Exhaust System:

The exhaust system shall consist of a silencer and flexible connection.

The silencer shall be a critical type, sized to meet or exceed the engine requirements. The silencer shall be provided with a drain, flange connection and companion flanges.

The flexible connection shall be bellows type, not less than 12 inches in length and installed between the engine exhaust and the Schedule 40 galvanized steel exhaust pipe. The flexible connection shall be constructed of Type 321 stainless steel and shall be provided with flanged ends for connection to the engine and galvanized steel exhaust pipe.

Diesel Fuel Tank: The engine shall be equipped with a double wall diesel fuel tank of not less than 200-gallon capacity. The fuel tank shall be base mounted, and shall be complete with fuel level indicator, diesel fuel leak detection sensors, flexible fuel lines, vent, and fill devices.

Starting Batteries: Storage batteries for engine starting and other requirements shall be heavy duty, lead-acid type. Total minimum battery capacity shall be 1250 cold cranking amperes below 32ºF. Batteries shall be mounted in corrosion resistant battery racks located within the skid base and shall be provided with battery cables of sufficient length to connect to the DC apparatus.

Generator:

The generator shall be a brushless type, single bearing, self-aligning, standby duty, synchronous type, with a drip-proof enclosure. The insulation shall be NEMA Class H or better.

The generator shall be rated at 400 kW , 500 kVA, 0.8 power factor, 277/480 volts, 3-phase, 4-wire, 60 Hz, and 1800 RPM. The generator shall have the following capabilities:

1. Steady state voltage regulation at full rated load shall be within plus or minus one percent.
2. Voltage regulation shall be within plus or minus 2 percent of rated steady state voltage from no load to full load.
3. Voltage recovery shall be within 2 percent of nominal rated voltage within 5 seconds, after the rated load is applied or removed in one-step.

Standby Generator Control Panel:

A completely wired and assembled standby generator control panel shall be mounted on the engine-generator unit. The panel and its components shall comply with NEMA ICS 1, "Industrial Controls and Systems," and shall be fully enclosed and vibration isolated. The panel shall include the following switches and instruments exposed on the front of the control panel:

1. AC ammeter.
2. AC voltmeter.
3. Three-position combination ammeter-voltmeter-phase selector switch.
4. Frequency meter.
5. Manual reset generator exciter circuit breaker with thermal magnetic trips.
6. One SPDT low-level fuel contact for remote monitoring.
7. Manual "START-STOP" switch.
8. Indicating lights to show cause of emergency shutdown.
9. Emergency "STOP" switch.
10. Voltage adjust rheostat.
11. Engine oil pressure gage.
12. Engine running time meter.
13. Engine water temperature gage.
14. One SPDT contact for remote monitoring of all standby generator failures.
15. One SPDT contact for remote monitoring standby generator running status.
16. Controls and indicators for diesel tank fuel leak detection.

Equipment mounted in the control panel shall be arranged for easy service access. Equipment or devices to be mounted within the standby generator control panel shall include the following:

1. Battery charger.
2. Automatic voltage regulator.
3. Automatic starting controls.
4. Radio interference suppression
5. Transformers, relays and other equipment required for proper operation.

Battery Charger:

The battery charger shall be of the three stage type rated for 120 –volt input and mounted in the standby generator control panel. The battery charger shall be provided with the following features:

1. Dual fusing for AC input and DC output.
2. Automatic DC voltage Regulation.
3. Automatic Load Regulation.
4. DC cranking circuit disconnect relay.
5. DC ammeter.
6. DC voltmeter.

Miscellaneous Accessories:

A drip pan fabricated of not less than 20-gage galvanized sheet steel with turned up edges rolled over wire, sized to catch all oil or grease which may drop from the engine, shall be provided under the engine-generator set.

A galvanized sheet metal duct shall be fabricated and installed between the radiator and the exhaust louvers. This radiator cooling air exhaust duct shall be installed with vibration isolators.

The generator main power disconnect shall be 600-volt, 3-pole, 600-ampere trip molded case, thermal-magnetic, circuit breaker with adjustable AC magnetic trip and shall be mounted in a NEMA Type 1 enclosure on the side of the generator housing. The interrupting capacity of the circuit breaker shall be not less than 65,000 amperes at 480 volts AC.

A warning sign shall be mounted at a location on the standby generator set approved by the Engineer. The sign shall be sheet aluminum, not less than 12-gage with a baked enamel coating with rounded corner. Sign covering shall be engineer grade reflective sheeting. The sign shall have a red background and white upper case letters not less than 2 inches in height. The sign inscription shall read as follows:

DANGER
AUTOMATIC
MAY START AT ANY TIME

A commercial quality battery hydrometer with plastic type storage container, and a commercial quality one-gallon battery filler with filler hose and one gallon of distilled water, shall be furnished and installed adjacent to the battery location. The body of the battery filler shall be clearly marked "DISTILLED WATER" in letters not less than ½ inch in height.

PART 3 – EXECUTION

The standby generator assembly shall be mounted on a steel channel skid base with vibration isolators. Anchoring devices shall be as recommended by the standby generator manufacturer and shall be installed to fasten the standby generator assembly securely to the concrete slab.

The Diesel fuel tank shall be full of fuel at the time of the acceptance of the contract. Full compensation for the cost for the fuel is included in the lump sum amount paid for building work.

The warning sign shall be mounted on the standby generator in a location facing direction of foot traffic isolators shall be installed between the engine base and the concrete slab.

FABRICATION

The standby generator shall be factory assembled and tested prior to shipment.

TESTING

The standby generator system, including transfer switch, shall be tested at completion of installation and adjustments.

All necessary materials, test equipment and recording instruments, and labor required for the tests shall be furnished. The Contractor shall notify the Engineer not less than 5 working days in advance of testing. Testing shall be performed in the presence of the Engineer.

The standby generator shall be tested for compliance with the conditions shown on the plans and the requirements specified in these special provisions.

Tests shall utilize a resistive load bank supplied by the Contractor. All transient requirements shall be demonstrated by means of recording instruments. All engine safety shutdown devices shall be demonstrated.

A battery and starter test shall consist of 30 seconds of continuous cold cranking without engine start, followed immediately by a normal engine start without excessive starter laboring.

A 4-hour heat run shall be conducted at 100 percent of generator rated full load capacity at the specified rated voltage.

DEMONSTRATION

The Contractor shall provide four hours of on-site training on the use, operation, and maintenance of the standby generator for not more than 8 designated State employees.
Training shall include hands-on training and giving course participants actual trouble-shooting and maintenance experience.

12-16.09 FIRE ALARM AND DETECTION SYSTEM

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a complete and operational fire alarm and detection system inclusive of all forms of shutdown controls in accordance with the details shown of the plans and these special provisions.

The system shall include all materials, whether mentioned or not, but are necessary for the complete and operational fire alarm and detection system.

SYSTEM DESCRIPTION

Design Requirements:

The fire alarm and detection system shall be a low voltage, direct current, zoned, closed circuit, electrically supervised, and Class A fire alarm and detection system. The system shall consist of fire alarm control panel, manual pull stations, smoke detectors, duct smoke detectors, heat detectors, end-of-line resistors, audio-visual devices, and all other necessary appurtenances.

The alarm system components shall be listed by U.L. or F.M. and the California State Fire Marshal.

The fire alarm system shall conform to the California Electrical Code (CEC) Article 760, California Fire Code (CFC) Article 1007 and 2007 NFPA 72 National Fire Alarm Code as amended by California Building Code.

SUBMITTALS

Product Data:

Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include brand name and catalog reference of equipment supplied, wiring diagrams, battery calculations, voltage drop calculations, riser diagrams and floor plans showing all devices and conduit and conductor sizes.

Working Drawings: Complete working drawings shall be submitted for approval.

State Fire Marshal Approval: Prior to the submittal of the working drawings to the State Fire Marshall, the Contractor shall have said drawings stamped "APPROVED" by the Engineer. Allow 12 weeks for State Fire Marshal review and approval.

PART 2 - PRODUCTS

Fire Alarm Control Panel:

Fire alarm control panel at shall be surface-mounted, locking cabinet, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires and end-of-line resistors installed within the control panel. Panel shall be capable of communicating with addressable devices, annunciators, transfer switch and the fire pump controller. When a device is activated, the panel shall display the zone where the device is located and the zone number as shown on the plans. Panel shall be able to communicate with the fire pump controller provided.

The control panel shall conform to the following requirements:

Compatible with Radionics 6000 or 6500 receiver or equivalent;
Minimum 8 zones expandable to 16 zones;
Digital dialer communicator;
Audible trouble signal, silencing switch and trouble pilot light;
Solid state, modular construction;
Fan shut down relays;
24-hour standby batteries, battery charger with automatic transfer on loss of utility company power and retransfer upon restitution of utility power;
Indicating lights for normal power failure, battery power failure, audible alarm, and silencing switch;
Low battery reporting.

Manual Pull Station: Manual pull station shall be single-action, addressable, closed circuit, pull down type pull station mounted on a standard electrical outlet box. The manual pull station actuating contact shall function continuously until reset. The pull station shall have provisions for fire drill and testing and shall have integral LED light to indicate operation of the pull station.

Smoke Detector: Smoke detector shall be addressable and ionization type detector with dual chamber with sensitivity control and plug-in detector head. One chamber shall be for detection and the other for changes in ambient parameters. The smoke detector shall have integral LED light to indicate operation of the smoke detector.

Duct-mounted Smoke Detector:

Duct-mounted smoke detector shall be similar to the space smoke detector except it shall have the following additional features:

Sampling tube;
Uniform sensitivity between 500 feet to 3,000 feet per minute air velocity;
Test jack.

Heat Detector: Heat detector for automatic detection of fire shall be addressable compact and rugged construction employing rate-of-rise and fixed temperature methods of detecting fires. The heat detectors shall have twist-and-lock type plug-in detector head, and low profile.

Audio-visual Device: Audio-visual device shall be addressable vibrating type horn with flashing light and adjustable volume control with maximum audible output of 90 dB at 10 feet from the horn. Frequency of audio visual flash shall be not less than one flash per second.

Visual Device: Visual device shall be addressable, flashing light with a flash rate of not less than one flash per second.

Fan shut down relays: Provide and install fan shut down relays as required.

Annunciator. Annunciator shall be a flush mounted eight zone LED annunciator that is capable of communicating with the fire alarm control panel to display the same message displayed by the fire alarm control panel.

PART 3 - EXECUTION

INSTALLATION

The fire alarm system shall be installed in accordance with the manufacturer's recommendations. No modification of the recommended alarm system type, components type, or replacement shall be made without prior written approval from the Engineer.

Fire alarm panel zoning: Fire alarm panel zoning shall be as follows:

Zone 1: Office Area-south
Zone 2: Office Area- Middle (Observation Room Vicinity)
Zone 3: Office Area - north
Zone 4: Inspection Area- Lanes 1 and 2
Zone 5. Inspection Area Lanes 3 and 4
Zone 6. Inspection area -West

Conduit and Conductors:

Fire alarm system wiring shall be installed in conduits conforming to the requirements of "Basic Materials and Methods" elsewhere in these special provisions. Conduit size shall be as recommended by the fire alarm system manufacturers except that conduits shall be not less than ½-inch diameter, trade size. Within the Electrical Room, Mechanical Room, Water Treatment Room, Inspection Areas and Vehicle Maintenance Shop, conduits shall be exposed. Within the office areas and all other areas, conduits shall be concealed in ceiling or walls.

Conductors and cables for the fire alarm system shall be as recommended by the fire alarm system manufacturer.

Detectors Installation:

Test jacks for duct smoke detectors shall be installed at accessible locations as approved by the State Fire Marshall.

Detectors shall not be installed until the cleanup of all trades has been completed and finalized (2007 NFPA 72 Section 5.7.1.11).

Prior to requesting final approval of the installation from the State Fire Marshall, the installing contractor shall furnish a written statement to the State Fire Marshal to the effect that the system has been installed in accordance with approved plans and completely tested in accordance with manufacturer's specifications and appropriate NFPA requirements (2007 NFPA 72 Section 4.5.1.2).

Upon completion of the installation of the fire alarm system, a satisfactory test of the system shall be made in the presence of the State Fire Marshal.

FIELD QUALITY CONTROL

Testing: The operational test for the fire alarm system shall be performed by the Contractor in the presence of the Engineer. Prior to the test, Contractor shall tabulate the field signaling devices data in the following format and get it approved by the Engineer.

Example format for the fire alarm testing forms is provided in the Information Handout.

The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and that the system is stable under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

Monitoring:

The Contractor shall provide monitoring services for the facility for one year after the acceptance of the contract. The services shall include a toll free telephone line connecting to the 24-hour on call monitoring station. Monitoring station shall contact designated site representative in the event of alarm and dispatch an immediate on-site response to the alarm location if the site representative cannot be reached or verification of the cause of the alarm cannot be determined.

Monitoring services after the first year will be handled by the State.

DEMONSTRATION

Training: The Contractor shall provide one hour of on-site training on the use, operation, and, maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

12-16.10 INTRUSION ALARM SYSTEM

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a complete and operational intrusion alarm system in accordance with the details shown on the plans and these special provisions. The intrusion alarm system shall be an intrusion alarm and access control system and a security camera system for the exterior lobby door as shown on the plans and specified in these special provisions.

The system shall include all materials, whether mentioned or not, that are necessary for a complete and operational intrusion alarm system.

SYSTEM DESCRIPTION

Design Requirements:

The intrusion alarm system shall be a low voltage, direct current, zoned intrusion alarm and access control system, and shall consist of an intrusion alarm control panel, access system main control panel, access system slave controllers, expansion modules, magnetic contact switches, combination detectors, glass break discriminators, digital keypad stations, system monitor and computer complete with software. The security camera system shall be a complete camera system and shall include of a security camera assembly, security camera monitor, power supply, power cable and video cable.

The intrusion alarm and access control system shall be interconnected as one system. Both systems shall be wired, connected and left in first class operating condition. Both systems shall be electrically supervised, 4-wire, Class B system and shall use closed loop initiating device circuits with individual zone supervision, individual indicating appliance circuit supervision, incoming and standby power supervision. Both systems shall be an addressable system complete with built-in or portable reprogramming capabilities so that all reprogramming and reconfiguration of the system can be accomplished without removal of any solid state devices. Hardware, software and password used in programming the system and the I/O map shall be submitted to the Engineer.

The alarm system shall self-test and report status of individual zones every twenty four (24) hours.

The system shall have an automatically rechargeable back-up power supply system, 24 hour minimum capacity for building operation, in case of building power interruption. Upon receiving a signal from the fire alarm control panel that fire is detected in the building, the system shall de-activate all exterior doors for safe exiting of all personnel.

The system components shall be U.L. or F.M. Listed. The system proposed shall be approved by the Federal Communication Commission (FCC). The intrusion alarm and access system components shall be UL listed for commercial use.

Attention is directed to the requirements specified under "Door Hardware" in Section 12-8, "Doors and Windows," regarding door hardware equipment such as electric strikes, electric lock sets,exit devices, panic exit devices, power transfer offset hinges and power transfer hinges connected to the electrical system.

SUBMITTALS

Product Data:

Manufacturer's descriptive information, working drawings and installation instructions shall be submitted for approval.

Working drawings. Working drawings shall be submitted for approval. Working drawings shall include voltage drop and standby battery calculations, building floor plan with component layout, system riser diagram including wiring layout, interconnection between intrusion and access control system and conduits and conductor sizes. Working drawings shall show the shape, size and method of attachment for each component used in the work. Control and wiring diagrams shall include rough in dimensions, component layout and conductor number identification.

Installation instructions shall include manufacturer and catalog reference, and model number of equipment to be furnished.

Test Reports. Submit results of electrical continuity, insulation and ground continuity test performed on installed wiring.

QUALITY ASSURANCE

Installer Qualification: The installer of the intrusion alarm and access control system shall be licensed by the State Department of Consumer Affairs, Bureau of Collection and Investigative Services. License numbers and expiration dates shall be included on all correspondence.

Manufacturer Qualification: The server manufacturer shall have not less than five (5) years experience in products or systems similar to the size and complexity for this project and with a record of successful service performance.

PART 2 - PRODUCTS

Intrusion Alarm Control Panel:

The intrusion alarm control panel shall be a surface-mounted, locking cabinet, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires.

The intrusion alarm control panel shall meet the following requirements:

Compatible with Bosch D9412GV2 or equivalent;
Capable up to 246 individually identified points;
Capable of controlling up to 8 doors;
Addressable expansion module;
Digital dialer communicator;
12-volt auxiliary power supply;
Rechargeable battery (24 hour minimum);
Battery charger;
Low battery reporting;
Silent alarm signaling;
System connected to RJ31X or RJ38X telephone jack or equivalent;

Line test every twenty-four (24) hours
120-volt, AC, input
Front accessible control and indication digital keypad.

Access System Main Control Panel:

The access system main control panel shall be a series door controller with an alphanumeric keypad in a surface-mounted, self-contained lockable control panel suitable for 120-volt, AC, input power with separate terminals for all external wires.

The access system control panel shall meet the following requirements:

Compatible with the intrusion alarm control panel;
Capable of managing up to 128 door operators and 5,000 card holders;
Network Ethernet modem
12-volt auxiliary power supply;
Rechargeable battery (24 hour minimum);
Battery charger;
120-volt, AC, input;
Capable of managing up to three slave controllers;
Operate up to 4 doors and 8 card readers;
Front accessible control and indication digital keypad.

Access System Slave Controller:

The access system slave controller shall be a series door controller without a keypad or faceplate mounted in a surface-mounted, completely self-contained lockable control panel suitable for 120-volt, AC, input power with separate terminals for all external wires. Slave controller shall be capable of controlling 4 doors and 8 card readers. Controller shall be provided with automatic standby battery powered power supply for controlling all doors and card readers managed by the unit for up to 24 hours.

System Computer, Monitor and Printer:

System computer shall be a premanufactured tower style server with accessories. Computer shall have all the software needed to run the control terminal and the access control system. In addition the original DVD or CD copy to the of the access control system software and manuals, inclusive of all licenses, shall be handed over to the Engineer. The system computer monitor and printer shall meet or exceed the following minimum requirements:

Processor: 2.66 GHz, minimum, quad core, x86_64;
Memory; 4 GB fully buffered DIMMs ECC
Hard Drive: 3.5 inch, SATA-II, 7200 RPM, 750 GB;
Operating System; Microsoft Windows Small Business Server 2008 Premium;
Graphics Card: PCI Express 512 MB;
Ethernet Connection: Internal 10/100/1000 Mb/s;
Modem: V.92 internal;
DVD Drive: 16X DVD ± RW Drive;
PCI Expansion Slots: Minimum six PCI or PCIe Expansion slots;
Power Supply: 930 W with hot plug redundant power;
Keyboard mouse: USB port and optical mouse;
Printer: Multifunction Laser with 128 MB memory;
Monitor: 24-inch Widescreen LCD, 5 ms response min 1000:1 contrast;
UPS: 1500 VA, 120-volt, AC, 6 plug surge protection.

Software:

Software shall be an application that is routinely advertised and supplied for access control and intrusion alarm monitoring by the access control panel manufacturer. The software shall be capable of integrating with Bosch D9412G or equal. The software shall include hour, day of week and day of month based and shall be capable of executing the following functions.

Alarm/disarm any specific zone;
Bypass/unbypass a point;
Activate/deactivate all relays;
Send a report to monitoring station and access control terminal;
Automatically adjust system clock for daylight savings time;
Turn an access authority level on/off
Hold any door open (unlocked and shunted) for an unlimited time;
Secure any or all doors closed (locked, no valid cards will allow entry;
Return a door to normal operation (locked valid cards will allow entry)
Turn recording of access grant events on/off;
Turn recording access denied events on/off.

Magnetic Contact Switch:

Magnetic door switch for pedestrian door shall be a 2-section, self-lock mounting type switch, and shall be compatible with the material of the door on which it is installed. The switch shall be epoxied in the switch housing. Magnetic contact switches shall be the type capable of being concealed on the top of the door frame.

Magnetic contact switches for the overhead vehicle doors shall be 2-section, extra heavy-duty, floor mounting type switch with stainless steel armored cable.

Switch shall be housed in a non-magnetic case.

Glass Break Discriminator: Glass break discriminator shall be an acoustic glass break detector. Detector shall respond to energy of breaking windows using piezo-electric crystal microphone. Sensor coverage pattern shall be directional, detecting breakage of uncovered glass in a 34-foot wide area at a distance of 11½ feet minimum. The sensor shall be housed in a fire retardant ABS housing.

Expansion Module: Expansion module shall be an addressable expansion module mounted inside a NEMA Type 1 enclosure. Module shall be compatible with the access control system and intrusion alarm system that is provided. Module shall include end-of line resistors required for the proper operation of the system.

Card Readers: Card reader shall be vandal resistant, weatherproof, with stainless steel housing filled with epoxy resin. Building access digital card readers shall use dual technology low profile reader. Card reader shall be compatible with the access control system and application software.

Entrance Cards: Entrance cards shall be of credit card type plastic material and shall be compatible with the card readers and access system control panel. Entrance cards shall be compatible with the card reader that is provided.

Entrance Card Printer: Entrance card printer shall be a card printer that handles high volume of printing credit type plastic material. Printer shall include five panel color dry film, PVC test cards, parallel USB cables and cleaning kit. Printer shall be compatible with the access system that is provided.

Pushbutton Station. Pushbutton station shall be 1 1/8-inch heavy duty oil-tight mushroom type pushbutton with one normally- open contact. Contact rating shall be suitable for the electric strike that is provided.

Security Camera System: Security Camera system shall be similar to the "Closed Circuit Television System" as specified elsewhere in these special provisions except for the following:

1. Security camera system shall not have transmitter, fiber optic cable, fiber optic/video converter and pan and tilt.
2. Security camera system shall include power supply, dome type enclosure, power cable and video cable.

Power Supply. Power supply for the security camera system shall be wall-mounted unit, plug in type, 120 VAC input, 24 V AC output and size shall be rated as recommended by the camera assembly manufacturer.

Camera enclosure with mounting bracket shall be of wall-mounted type assembly with lower dome, back box and all of stainless steel construction and shall meet NEMA 4X standards.

Power Cable: Power cable shall be jacketed 3-conductor, 14 gauge stranded cable.

Video Cable. Video cable shall be coaxial type RG59.

PART 3 - EXECUTION

INSTALLATION

The intrusion alarm system shall be installed in accordance with the manufacturer's recommendations.

The switch section without wires shall be recessed flush into the top edge of the door at the approximate center of the door, and the switch section with wires shall be recessed flush in the top section of the door frame. The two sections of the switch shall be mounted directly opposite each other to provide maximum sensitivity. The wiring from each magnetic switch shall be run to the control panel in the zone dedicated for the intrusion alarm circuit.

The switch section mounted on the bottom edge of the overhead door shall be without wires. The switch section with wire shall be mounted on the floor directly below the switch part without wires. Magnetic contact switches for overhead doors shall be mounted.

The glass break discriminator shall be mounted on the ceiling at locations shown on the plans.

The end of line resistors shall be installed inside the control panel.

Combination detector shall be mounted at not less than 7½ feet above finished floor at locations shown on the plans.

Intrusion alarm zoning: Intrusion alarm panel zoning shall be as shown on the plans.

Conduit and Conductors:

All intrusion alarm system wiring shall be installed in conduit system conforming to the requirements under "Basic Materials and Methods" elsewhere in these special provisions. Conduit size shall be as recommended by the intrusion alarm manufacturer, except that conduits shall be not less than ½-inch diameter. Within the Electrical Room, Mechanical Room, Water Treatment Room, Inspection Areas and Vehicle Maintenance Shop, conduits shall be exposed. Within the office areas and all other areas, conduits shall be concealed in ceiling or walls.

All conductors and cables for the intrusion alarm system wiring shall be as recommended by the intrusion alarm system manufacturer.

FIELD QUALITY CONTROL

Testing: The operational test for the intrusion alarm system shall be performed by the Contractor in the presence of the Engineer. The operational tests shall demonstrate that all functions of the system operate in the

manner described in the manufacturer's literature and demonstrate system stability under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

Monitoring:

The Contractor shall provide monitoring services for the facility for one year after the acceptance of the contract. The services shall include a toll-free telephone line connecting to the 24-hour on call monitoring station. Monitoring station shall contact designated site representative in the event of alarm and dispatch an immediate on-site response to the alarm location if the site representative cannot be reached or verification of the cause of the alarm cannot be determined.

Monitoring services after the first year will be handled by the State.

DEMONSTRATION

Training: The Contractor shall provide one hour of on-site training on the use, operation, and maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

12-16.11 BUILDING WATER CONTROL SYSTEMS

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing building water control system in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data:

A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2 - PRODUCTS

Building Water Control Enclosure:

Building water control enclosure shall be single exterior hinged door, dust tight NEMA Type 3R enclosure, containing an electrical mounting panel and hinged interior panel. The enclosure shall be made of 14-gage steel minimum with all seams continuously welded. A rolled up lip shall be provided around three sides of the hinged door and around all sides of the enclosure opening. The door shall be provided with a neoprene gasket that is attached with an oil-resistant adhesive. The door shall be maintained closed with door clamps. Security shall be provided by a hasp and staple for padlocking.

The enclosure shall be factory prewired in conformance with NEMA Class IIC wiring. All wires entering the enclosure shall terminate on terminal blocks. All interior control wires shall be 7 strand No. 14 MTW except for hinge wiring which shall be 19-strand No. 14 MTW. Use of gray colored insulation conductors for wiring is prohibited. Wires shall be neatly trained and bundled, and wiring troughs shall be provided in the enclosure as necessary. Wiring shall be arranged so that any piece of apparatus may be removed

without disconnecting any wires except the leads to that piece of apparatus. No equipment or device shall be mounted on the side or at the bottom of the panel.

A wiring diagram encased between two heat-fused laminated plastic sheets shall be provided with brass mounting eyelets and attached to the inside of the enclosure.

Main Disconnect: Main disconnect shall be 3-pole, 240-volt, AC, molded case circuit breaker with 100-ampere frame, 50-ampere trip, and interrupting capacity of not less than 10,000 amperes (symmetrical) at 240 volts. Breaker shall be Square D Company, Eaton/Cutler Hammer or equal.

Pump Disconnect: Pump disconnect shall be 2-pole, 240-volt, AC, molded case circuit breaker with 20-ampere trip, and interrupting capacity of not less than 10,000 amperes (symmetrical) at 240 volts. Circuit breaker shall be Square D Company, Eaton/Cutler Hammer, or equal.

Circuit Breakers: Circuit breakers, CB1 thru CB4 shall be single-pole, 120-volt, AC, molded case circuit breakers with 20-ampere trip, and interrupting capacity of not less than 10,000 amperes (symmetrical) at 120 volts. Circuit breaker CB2 and Circuit breakers shall be Square D Company, Eaton/Cutler Hammer, or equal.

Control Disconnect: Control disconnect shall be single-pole, 120-volt, AC, molded case circuit breaker with 20-ampere trip, and interrupting capacity of not less than 10,000 amperes (symmetrical) at 120 volts. Circuit breaker shall be Square D Company, Eaton/Cutler Hammer, or equal.

Remote Control Disconnect: Remote control disconnect shall be double-pole, 240-volt, AC, 20-ampere trip, non-fusible disconnect mounted on a terminal block.

Starters, ST1 and ST2: Starter shall be NEMA Size 0, NEMA rated, 2-pole, 600-volt, contactor with 120-volt coil, and non-adjustable overload relay. Overload relay shall be resettable by an externally operable pushbutton on the hinged interior deadfront panel. Overload relay shall have three thermal overload elements and shall trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starter shall be NEMA rated.

Control Relays, CR1, CR2, CR3, CR4 and CR5: Control relays CR1, CR2, CR3, CR4 and CR5 shall be 120-volt, AC, general purpose relay with 3-pole, double-throw, 10-ampere, 120-volt, AC, contacts. Relay shall be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relay shall be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals. Relay shall be Square D Company, Struthers-Dunn, Eagle Signal, or equal.

Motor Contactor, MCR: Motor contactor, MCR, shall be NEMA size 1, full voltage, double pole, NEMA rated, contactor rated 2 HP at 120V, AC.

Neutral Bar: Neutral bar shall be 100-ampere copper neutral bar with circuit taps.

Ground Bar: Ground bar shall be 100-ampere copper neutral bar with circuit taps.

Time Meter, TM: Time meter shall be 208-volt, 60 Hz running time meter with 0 to 99,999.9 hours range without a reset.

Terminal Block, TB: Terminal block shall be 30-ampere, 300-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electric potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

Failure Resets, FR1 and FR2: Failure reset shall be heavy duty oil-tight pushbutton with one normally closed contact. The contact shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

Selector Switch, SS: Selector switch shall be rotary action, single-pole, 3-position, 10-ampere, 120-volt switch. Switch contacts shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switch shall have legend plate marked Hand-Off-Auto.

Alarm Light, AL: Alarm light shall be fluorescent, weatherproof light fixture for use with threaded rigid conduit. Light fixture shall have red globe. Lamp shall be two 9-watt, 120-volt standard service fluorescent lamp, complete with ballast and screw-on type base.

Pilot Lights, PL1, PL2, PL3, PL4 and PL5: Pilot light shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp. PL1 and PL2 shall have green domed cap. PL3 and Pl4 shall have red domed cap.

Alternator ALT: Alternator switch shall be 120-volt, 60 Hz, synchronous motor driven, mechanical memory, 60-minute recycling timer with single-pole, double-throw, snap action, 15-ampere, 120-volt contact. Contact positions shall alternate at 30-minute intervals.

Motor Savers, MS1 and MS2: Motor saver, MS, shall be a pump protector. Motor saver shall measure the power consumed by the well pump motor and shall shut off the well pump whenever the measured power differs from normal running value to protect the pump from running dry or overloading. Also the motor saver shall protect the pump from current unbalance and rapid cycling. The motor saver shall be furnished with current transformers built in the unit. The motor saver shall have one normally open and one normally closed contact rated 480 VA at 120 volts.

FABRICATION

Component Mounting:

The following electrical components shall be mounted on the back panel of Building Water Control Enclosure: Main disconnect, pump disconnects, circuit breakers, control disconnect, remote control disconnect, motor savers, alternator, ground bar, starters, control relays, neutral bar, Terminal block, and Time meters. Spacers shall be installed with all breakers so that they are externally operable with the hinged door closed. The hinged door shall only open when the MB is in the "OFF" position.

The following electrical components shall be mounted on the interior door of Building Water Control Enclosure: selector switches, and pilot lights.

The alarm light shall be mounted on top of the control panel as shown on the plans.

PART 3 - EXECUTION

INSTALLATION

The building water control panel shall be surface mounted at the location as shown on the plans.

All bolts and fasteners shall be galvanized.

OPERATION

Building Water System:

When the pressure inside the water pressure tank falls below the set pressure limit, one of the booster pumps as determined by the alternator shall be energized.

When any of the booster pump fails, the pilot light PL3 and alarm light AL is energized. The alarm light AL shall remain energized until manually reset by the failure reset pushbutton, FR1.

Float switch, FS2, in the water storage tank when activated shall energize the motor contactor MCR, and as a result, the chlorination process is activated and the a signal is sent to the reverse osmosis unit to transfer water to the water storage tank. The chlorination process and the transfer of water from the reverse osmosis unit to the storage tank will continue until the float switch FS2 is deactivated.

When the domestic well fails to deliver water and the water level falls below the float switch FS1, the pilot light PL4 and alarm light AL are energized.

The control circuit for the building water supply system is disabled to operate if the domestic water well system fails to deliver water via the remote contact from control relay CR3 that is located in the domestic water supply control system.

Float switch FS3 when activated will energize the pilot light PL5 and alarm light AL. In addition, the chlorination process and the transfer of water to the storage tank will be deactivated. Pilot light PL5, the chlorination process and the transfer of water from the reverse osmosis unit to the water storage tank shall remain deactivated until manually reset by the failure reset pushbutton FR2.

12-16.12 DOMESTIC WATER SYSTEM CONTROL PANEL

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing domestic well pump and booster pump control station in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data:

A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2 - PRODUCTS

Domestic Well Pump Control Panel Enclosure:

Domestic well pump control panel enclosure shall be single exterior hinged door, NEMA Type 3R enclosure, containing an electrical mounting panel, hinged interior door, and floor stands. The enclosure shall be made of 14-gage steel minimum with all seams continuously welded. A rolled up lip shall be provided around three sides of the hinged door and around all sides of the enclosure opening. The door shall be provided with a neoprene gasket that is attached with an oil-resistant adhesive. The door shall be maintained closed with door clamps. Security shall be provided by a hasp and staple for padlocking.

The enclosure shall be factory prewired in conformance with NEMA ICS 18 Class II, Type C wiring. All wires entering the enclosure shall terminate on terminal blocks. All interior control wires shall be 19-strand No. 14 MTW. Wires shall be neatly trained and bundled, and wiring troughs shall be provided in the enclosure as necessary. Wiring of the control panel with gray color insulation conductor shall be prohibited. Wiring shall be arranged so that any piece of apparatus may be removed without disconnecting any wires except the leads to that piece of apparatus.

A wiring diagram encased between two heat-fused laminated plastic sheets shall be provided with brass mounting eyelets and attached to the inside of the enclosure.

Well Service Disconnect, WSD: Well service disconnect shall be 3-pole, 600-volt, AC, molded case circuit breaker with 100-ampere frame, 90-ampere trip, and interrupting of not less than 14,000 amperes (symmetrical) at 600 volts.

Starters, ST1 and ST2: Starter, ST1, shall be NEMA Size 2, NEMA rated, 3-pole, 480-volt, combination starter with motor circuit protector and starter with 120-volt coil, and non-adjustable overload relay. Overload relay shall be resettable by an externally operable pushbutton on the hinged interior deadfront panel. Overload relay shall have three thermal overload elements and shall trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Starter shall be NEMA rated. Starter, ST2, shall be similar except ST2 shall be NEMA Size 0.

Pumps Selector Switch: Pump selector shall be NEMA 3R type, 30-ampere, 3-pole, 2-throw, and 240-volt rated, surface mounted type safety switch without OFF position. Selector switch shall have nameplate marked Pump No. 1 and Pump No. 2 to indicate the switch position.

Control Transformer Primary Disconnect, CTPD: Control transformer primary disconnect shall be 2-pole, 600-volt, AC, 100-ampere frame, 15-ampere trip molded case circuit breaker. The interrupting capacity shall be not less than 14,000 amperes (symmetrical) at 600 volts.

Control Transformer Primary Fuse, CTPF: Control transformer primary fuse shall be 2-pole fuse holder 480-volt, AC with 6-ampere time delay fuses.

Control Transformer, CT: Control transformer shall be double-wound, dry-type 2 KVA, 60 Hz, transformer with 480-volt primary and 120-volt secondary.

Control Transformer Secondary Disconnect, CTSD: Control transformer secondary disconnect shall be single-pole, 120-volt, 100-ampere frame, 20-ampere trip, molded case breaker. The interrupting capacity shall be not less than 10,000 amperes (symmetrical) at 120 volts.

Control Disconnect, CD: Control disconnect shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Duplex Plug Disconnect, DPD: Duplex plug disconnect shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Irrigation Controller Disconnect, ICD: Irrigation controller disconnect shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Air Volume Controller Disconnect, AVCD: Air volume controller disconnect shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Spare Circuit Breaker: Spare circuit breaker shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Heat Tape Disconnect, HTD: Heat tape disconnect shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip, Type GFCI, molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Building Pump Control Disconnect, BPCD1: Building pump control disconnect shall be 2-pole, rotary switch with nameplate marked ON/OFF and mounted on the door.

Control Relays, CR1, CR2, and CR3: Control relay shall be 120-volt, AC, general purpose relay with double-pole, double-throw, 10-ampere, 120-volt, AC, contacts. Relay shall be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relay shall be barrier type, 11-contact relay socket with 10-ampere

contacts and screw terminals. Relay shall be Square D Company, Struthers-Dunn, Eagle Signal, or equal. Control relays CR4 shall be similar to control relay CR1 and shall have 24-volt coil.

Ground Bar: Ground bar shall be 100-ampere copper neutral bar with circuit taps.

Terminal Block, TB: Terminal block shall be 30-ampere, 600-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electric potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

Alarm Reset, AR1: Alarm reset shall be heavy duty oil-tight pushbutton with one normally closed contact. The contact shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

Pump Protector, PP: Pump protector shall be a solid state pump protector. Pump protector shall measure the power consumed by the pump motor and shall shut-off the pump whenever the measured power differs from the normal running value to protect the pump from running dry or overloading. Also the pump protector shall protect the pump from current unbalance and rapid cycling. The pump protector shall be furnished with current transformers built-in the unit. The pump protector shall have one normally open contact and one normally close contact rated 480 VA at 240 V.

Selector Switch, SS1: Selector switch shall be rotary action, single-pole, 3-position, 10-ampere, 120-volt switch. Switch contacts shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switch shall have legend plate marked "Hand-Auto."

Alarm Light, AL1: Alarm light shall be fluorescent, weatherproof light fixture for use with threaded rigid conduit. Light fixture shall have guard and red globe. Lamp shall be two 9-watt, 120-volt standard service fluorescent lamp, complete with ballast and screw-on type base.

Pilot Lights, PL1, PL2, PL3 and PL4: Pilot light shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with domed cap. Color of the cap shall be as shown on the plans.

Duplex Receptacle Outlet, DP. Duplex receptacle outlet shall be 3-wire, 15-A, 125-V (ac) grounded type with common feed and ground fault protection. Circuit interruption shall occur on 6 milliamperes (mA) of ground-fault current and shall not occur on less than 4 mA of ground-fault current. Duplex receptacle outlet shall be mounted on the interior hinged panel of the well pump enclosure.

FABRICATION

Component Mounting:

Components shall be mounted as shown on the plans. Spacers shall be installed with all breakers (WMB and CTO) so that they are externally operable with the hinged door closed. The interior hinged panel shall not be opened unless the well service disconnect is in the "off" position. Nameplates shall be fastened with self-tapping, cadmium-plated screws or nickel-plated bolts. Inscriptions and height of letters on nameplates and warning plates shall be as shown on the plans.

PART 3 - EXECUTION

INSTALLATION

The well pump control station shall be installed on a concrete pad and oriented as shown on the plans.

All bolts and fasteners shall be galvanized.

All concrete around conduit penetrations shall be finished smooth and sloped in a way to avoid standing water around the conduit.

OPERATION

Domestic well Pump System: The domestic well pump unit shall be automatically controlled by the pressure tank pressure switch, PS. Pressure switch setting shall be as shown on the "Water" plans. Relay, CR3, when energized, shall turn on the alarm light, AL1 and disable the building water supply control system.

12-16.13 CLARIFIER CONTROL PANEL

PART 1 - GENERAL

SUMMARY

Scope: This work shall consist of furnishing and installing a clarifier control panel in accordance with the details shown on the plans and these special provisions.

SUBMITTALS

Product Data:

A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2 - PRODUCTS

Clarifier Control Enclosure, WPC:

Clarifier control enclosure shall be single exterior hinged door, NEMA Type 3R enclosure, containing an electrical mounting panel, hinged interior ldoor, and floor stands. The enclosure shall be made of 14-gage steel minimum with all seams continuously welded. A rolled up lip shall be provided around three sides of the hinged door and around all sides of the enclosure opening. The door shall be provided with a neoprene gasket that is attached with an oil-resistant adhesive. The door shall be maintained closed with door clamps. Security shall be provided by a hasp and staple for padlocking.

The enclosure shall be factory prewired in conformance with NEMA ICS 18 Class II, Type C wiring. All wires entering the enclosure shall terminate on terminal blocks. All interior control wires shall be 19-strand No. 14 MTW. Wiring of control panel with gray color insulation conductors shall be prohibited. Wires shall be neatly trained and bundled, and wiring troughs shall be provided in the enclosure as necessary. Wiring shall be arranged so that any piece of apparatus may be removed without disconnecting any wires except the leads to that piece of apparatus.

A wiring diagram encased between two heat-fused laminated plastic sheets shall be provided with brass mounting eyelets and attached to the inside of the enclosure.

Clarifier Main Breaker, CMB: Clarifier pump main breaker shall be single-pole, 120-volt, AC, molded case circuit breaker with 100-ampere frame, 30-ampere trip, and interrupting capacity of not less than 10,000 amperes (symmetrical) at 120 volts.

Control Disconnect, CD: Control disconnect shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Duplex Plug Disconnect, DPD: Duplex plug disconnect shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Spare Circuit Breaker: Spare circuit breaker shall be single-pole, 120-volt, AC 100-ampere frame, 20-ampere trip molded case circuit breaker. The interrupting capacity shall be of not less than 10,000 amperes (symmetrical) at 120 volts.

Control Relay, CR1: Control relay shall be 120-volt, AC, general purpose relay with three-pole, double-throw, 10-ampere, 120-volt, AC, contacts. Relay shall be enclosed in clear plastic with 11-pin tube type plug base. Sockets for relay shall be barrier type, 11-contact relay socket with 10-ampere contacts and screw terminals. Relay shall be Square D Company, Struthers-Dunn, Eagle Signal or equal.

Neutral Bar, BAR: Neutral bar shall be 100-ampere copper neutral bar with circuit taps.

Ground Bar: Ground bar shall be 100-ampere copper neutral bar with circuit taps.

Terminal Block, TB: Terminal block shall be 30-ampere, 600-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electric potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

Alarm Reset, AR: Alarm reset shall be heavy duty oil-tight pushbutton with one normally closed contact. The contact shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor.

Alarm Light, AL: Alarm light shall be fluorescent, weatherproof light fixture for use with threaded rigid conduit. Light fixture shall have guard and red globe. Lamp shall be two 9-watt, 120-volt standard service fluorescent lamp, complete with ballast and screw-on type base.

Pilot Light, PL1: Pilot light shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with red domed cap.

Intrinsically Safe Relay, ISR1: Intrinsically safe relays shall be latching type and completely self-contained solid-state relays approved for use with sensors in Class I, Division 1 locations. Relay shall be suitable for supply voltage of 120-volts AC, with 0.3-ampere, 120-volt rated, single-pole double-throw contact. Relay shall have maximum turn-on time of 5 milliseconds, and maximum output current of 100 microamperes at 28 volts, DC.

Float Switch, FS1: Float switch shall be 120-volt, 10-ampere, single-pole, double-throw wide angle ball type mecahnical-activated. Switch enclosures shall be leak proof, shockproof and corrosion resistant and listed for use in sewage. Switch shall be provided with sufficient length of cable to run from the switch to the sewage lift pump control panel without splices. Switch shall operate at approximately 90 degrees of tilt. The switch shall come with all mounting hardware, weights, and assorted equipment necessary to be installed at the elevations shown on the plans and as recommended by the manufacturer.

Duplex Receptacle Outlet, DP: Duplex receptacle outlet shall be 3-wire, 20-A, 125-V (ac) grounded type with common feed and ground fault protection. Circuit interruption shall occur on 6 milliamperes (mA) of ground-fault current and shall not occur on less than 4 mA of ground-fault current. Duplex receptacle outlet shall be mounted on the interior hinged panel of the clarifier enclosure.

FABRICATION

Component Mounting: Components shall be mounted as shown on the plans.

PART 3 - EXECUTION

INSTALLATION

The clarifier control panel shall be installed on a concrete pad and oriented as shown on the plans.

All bolts and fasteners shall be galvanized.

All concrete around conduit penetrations shall be finished smooth and sloped in a way to avoid standing water around the conduit.

OPERATION

Clarifier Control Panel: The alarm light, AL, and pilot light, PL1, are energized by the float switch, FS1, in the clarifier tank. This will indicate a high water alarm condition in the tank.

12-16.14 TRUCK WEIGH-IN-MOTION SYSTEM

PART 1 - GENERAL

This work shall consist of designing, constructing, furnishing and installing a complete weigh-in-motion (WIM) system in accordance with the details shown on the plans and these special provisions.

This WIM system shall include a WIM Sorter Scale system and 2 lane slow-weigh-in-motion (SWIM) systems.

The components for the WIM system shall include concrete pavement, single load cell scales, WIM sorter cabinets, SWIM control cabinet, WIM controllers, uninterruptible power supply units, current switches, computers, printer, loop detectors, SWIM camera system that includes SWIM camera, SWIM camera illuminator, SWIM camera illuminator power supply and SWIM camera control panel, interconnecting cables and conductors and any other equipment not mentioned here in these special provisions, but is required for the successful operation of the system.

Each system shall automatically weigh all trucks crossing the scales, shall determine which axle or axles or which axle grouping or axle groupings of a particular truck exceed the weight limits shown in the weight violation table and the bridge weight table specified herein.

The Contractor shall be responsible for the compatibility of the sub-components for the WIM system, and the Vehicle Monitoring and Signal System (VMSS).

The Contractor shall provide a technical representative of the truck WIM manufacturer be on call and available at the jobsite within 24 hours of being contacted during construction, installation, adjusting and testing of the truck WIM system. The technical representative shall have full and complete knowledge of the installation and operation of the scale being installed.

WIM SORTER SCALE SYSTEM

The WIM Sorter Scale system main function shall be to direct traffic to the 2 SWIM Lanes by controlling the WIM sorter scale traffic signal in order to maximize the facility traffic throughput. Trucks that are under the weight limit as determine by the weight table shall be directed to the left lane and trucks that are near or exceed the weight limit shall be directed to the right lane. The threshold of the screening system for indicating an axle weight violation, tandem weight violation and gross weight violation shall be programmable within a range between 50 percent and 120 percent of the weight values set forth in the weight violation table and the bridge weight table.

The WIM Sorter Scale system shall operate at a vehicle speed range between 3 and 40 miles per hour and provide vehicle axle spacings, total wheel base, axle weights, tandem weights, and total weights of vehicles with the accuracy specified herein. The system shall be able to accommodate up to 9-axle trucks.

LANE SWIM SYSTEM

Each Lane SWIM system shall enhance the enforcement capacity of the facility by directing the violator vehicles to the static scale and allowing the non-violator vehicles to return to the highway by providing the proper control over the traffic signals and variableable message sign systems specified under VMSS.

Each Lane SWIM system shall operate independently of each other. Each lane shall be capable of operating in the "Auto", or "Manual" mode.

The 2 Lane SWIM systems shall operate at a vehicle speed range between 3 and 25 miles per hour and provide vehicle axle spacings, total wheel base, axle weights, tandem weights, and total weights of vehicles with the accuracy specified herein. The system shall be able to accommodate up to 9-axle trucks.

The SWIM computer shall be programmed to show 2 lanes of vehicle data. The display shall include lane designation, time and date, a minimum of 2 vehicle per lane and picture of each violator vehicle. Each vehicle display shall show weight for each axle, tandem weights, gross weight, axle spacings and overall vehicle wheel base.

A toggle key or pull-down menu shall allow the operator to select and view two lanes, one lane only, to select which lane to be displayed, to select picture of violator vehicle or no picture. A function key or combination of "shift" key and function key shall be assigned to print the data of a violator truck automatically or initiated by the operator for the each lane. The center lane shall used function keys and the left lane shall use same function keys with the "Shift" key of the computer keyboard.

The SWIM computer shall be capable of communicating with the WIM Sorter Scale system in order to allow the operator to change the threshold for violation, for viewing on line data of truck going over the sorter scale and to allow the operator to override the automatic operation.

COMPLIANCE WITH CALIFORNIA VEHICLE CODE (CVC)

Each Lane SWIM system shall automatically weigh all trucks crossing the scales, shall determine which axle or axles or which axle grouping or axle groupings of a particular truck exceed the weight limits shown in the weight violation table and the bridge weight table specified herein. All violations shall be communicated to the weighmaster via the general format of the display. The display shall have continuous CRT display update for keyboard selection of hard copy printout when desired. The display shall illustrate in a clear format the axle spacings and axle weights of the truck crossing the scale and shall highlight the overweight and overheight violations. The threshold of the screening system for indicating a weight violation shall be programmable within a range between 70 percent and 110 percent of the weight values set forth in the weight violation table and the bridge weight table.

The weight limitations contained in the weight violation table and the bridge weight table shall be the default settings. Such weights shall be programmable.

VEHICLE CLASSIFICATION

The Lane SWIM system shall provide for a minimum of 15 different vehicle classifications. Vehicle Class 1 through Vehicle Class 13 shall be in accordance with the requirements of Scheme F in Section 4, Chapter 3 of the Federal Highway Administration (FHWA) Traffic Monitoring Guide.

Vehicle Class 14 shall identify special vehicles as programmed by the SWIM system operator. Vehicle Class 15 shall identify all other vehicles not included in the other 14 classifications.

Classification criteria for Vehicle Class 1 through Vehicle Class 14 shall be programmable by the SWIM system operator.

Each Lane SWIM system shall provide sufficient flexibility in programming parameters, including number of axles, axle spacings, and weights (gross, or axle and gross) for each of these classes so that accurate classifying is achievable.

TRAINING

Training of State personnel for the SWIM system installed shall be provided in the areas of operation, calibration, trouble shooting and maintenance of each component such as SWIM controller, computer system, axle sensors, SWIM scales signal conditioners, and any other components that are critical to the operation of the system. The training period shall be for a period of 3 days, and minimum of 8 hours per day excluding lunch break time and shall be conducted for not more than 8 State personnel at the job site or at a State facility to be determined by the Engineer. The trainers shall be authorized representatives of the SWIM manufacturer, shall have complete knowledge of SWIM installation and operation and shall be qualified as a trainer. The course outline shall be submitted for approval two weeks prior to training session.

All trainees shall be supplied with books, manuals, and such other training material, guides and equipment, not mentioned, but required for a complete and thorough training course. Training shall include hands-on experience in programming techniques and operation.

MANUFACTURER REPRESENTATION

Manufacturer representation shall be as specified under "Truck Static Weighing System" in Section 12-10, "Specialties," of these special provisions.

ACCEPTANCE TESTING

An acceptance test shall be performed for the weigh-in motion system. Acceptance test shall be performed after 5 days of continuous trouble free operation of the functional test as specified elsewhere in these special provisions.

Acceptance test period shall be 5 days of sample not less than 150 trucks for each of the 2 SWIM system and for the Sorter WIM System. Ninety percent of the trucks sample shall meet the accuracy as specified under "Design" in these special provisions. The Contractor shall provide the personnel for conducting these tests.

In the event the accuracy of any one of the WIM system fail to meet the specifications, the failed system shall be retested with not less than 150 trucks sample following corrective work.

WARRANTY

The scales, lead-in cables, frames and mounting hardware provided shall include the manufacturers or suppliers 5 year warranty. All other equipment specified under on-site equipment of these special provisions shall include the manufacturers or suppliers one year warranty.

Such warranty periods shall begin upon completion of the acceptance test of the weigh-in-motion system and shall include all parts and all installation costs, including traffic control if necessary, to make the repairs.

SUBMITTALS

Manufacturer's descriptive material information, materials list, working drawings, block diagrams, principle of operation, schematic diagrams, generalized software flow chart, commented source code listing, instrumentation and technical manuals, parts list and manufacturer's warranties and guarantees shall be submitted for approval. Submittals shall be approved prior to the start of fabrication or installation.

After successful completion of the acceptance testing, and prior to the completion of the contract, 5 bound and identified copies of the operation, service and maintenance instructions and parts list for the equipment and

materials installed in the work and as-built plans which include schematic diagrams shall be delivered to the Engineer at the work site.

The State shall have the right to modify and reproduce software for site use only. The State will honor the software as proprietary to the vendor.

The approved manufacturer's warrantees and guarantees for the material and equipment installed in the work shall be delivered to the Engineer at the work site prior to the acceptance of the contract.

PART 2 - PRODUCTS

Concrete Pavement: Concrete pavement shall conform to the requirements specified under "Concrete Pavement (Weigh-in-Motion)," in Section 12-10.1, in these special provisions.

Single Load Cell Scale:

Single load cell scale shall be load cell type scale with a rating of 50,000 lbkg. For each scale the contractor shall supply the necessary signal conditioning. The output of the scale amplifier board shall be directly proportional to the weight placed on the scale. The manufacturer of the scale shall provide supervision and instruction for the installation of the scale and all related peripheral. The scale frame shall be anchored to the concrete foundation with ASTM Grade 8 or better fasteners. The anchor bolts shall be embedded a minimum of 8 inches into the concrete pavement. All scale, lead-in cables, and the peripherals shall be furnished by one manufacturer and shall be of the same make and model used in similar installations in the USA in at least 2 State Departments of Transportation.

The full width of the scale shall be equally active in reporting weight values. The outside surface of the scale shall be hermetically encapsulated with a vulcanized rubber or neoprene coating.

Loop Detectors: Loop detectors shall be as specified under "Weigh Station Bypass System" in these special provisions.

WIM Sorter Scale Control Cabinet: WIM sorter scale control cabinet, input file, power supply assembly shall conform to the requirements in the "Traffic Signal Control Equipment Specifications." Cabinet shall be similar to Model 334, except that the cabinet shall be furnished with WIM Power Supply Assembly, single load cell scale amplifier interfacing card, a DIN rail mounted terminal block mounted horizontally 8-inch from the bottom, a card cage and power supply for housing loop detector cards. Police panel will not be required. All exposed surface of the control cabinet shall be lined with high density foam, aluminum clad, insulation to prevent heat gain from the exterior. The insulation shall be attached to the cabinet with adhesive only. The R-value of the insulation shall be greater than R30. The control cabinet shall be equipped with exterior mounted thermo-electric type air conditioner unit sized to maintain interior cabinet temperature of 90 degrees Fahrenheit or below in an ambient temperature of 120 degrees Fahrenheit.

SWIM Control Cabinet: The SWIM control cabinet shall be NEMA Type 3 enclosure with 2 sections, one for the lane SWIM equipment and the other for the VMSS equipment. The VMSS equipment section shall house equipment specified under the "Vehicle Monitoring and Signal System" in these special provisions. The lane SWIM equipment section shall house the SWIM controller, PLC, single load cell scale amplifiers interfacing cards, power supply assembly, UPS, current sensor switches, circuit breakers, DIN rail mounted terminal block, a card cage and power supply for housing loop detector cards and all necessary connection between the various components that make up the SWIM system and the Vehicle Monitoring and Signal system. SWIM control cabinet shall be equipped with an electrical ventilation system similar to the WIM sorter control cabinet. The control cabinet shall be fed by 50-ampere, 120/208 V, single-phase, 3-wire circuit to supply all loads. The manufacturer shall provide branch breakers to feed each system from a separate breaker rated to suit controlled equipment. All exposed surface of the control cabinet shall be lined with high density foam, aluminum clad, insulation to prevent heat gain from the exterior. The insulation shall be attached to the cabinet with adhesive only. The R-value of the insulation shall be greater than R30. The cabinet shall be equipped with 2 thermo-electric type air conditioning units sized to maintain interior cabinet temperature of 90 degrees Fahrenheit or below in an ambient temperature of 120 degrees Fahrenheit.

Uninterruptible power supply: Uninterruptible power supply (UPS) shall be rated 1,000VA, 120-volt AC 60 Hz input line voltage, output voltage of 120 + 3.5 volts at 60 Hz, sine wave. Total harmonic distortion shall not exceed 7 percent. Power transfer from power line to UPS shall occur at approximately 102 volts, and restoring power to line supply shall occur at 110 volts. Transfer time shall not be more than 10 milliseconds. UPS shall be equipped with maintenance free battery that requires no more than 16 hours to recharge and provides 12 minutes of backup time at full load, or 30 minutes at half load. UPS shall have 4 NEMA Type 5-15R output receptacles. UPS shall be capable of operating at 104ºF. ambient temperature and 95 percent non-condensing humidity. UPS shall be rack mounted type suitable for mounting on the cabinet.

Current Switch: Current switch (CS) shall be a self-powered, solid-state, AC, current sensing switch with a single-pole, normally open contact. Contact rating shall be a minimum of 150 milliamperes DC current at 30 volts. AC current sensing level shall be selectable between a low range of one to 15 amperes, and high range of 15 to 300 amperes. Switch shall have a thru-hole of 0.55-inch minimum diameter for sensing AC current. Conductors with AC current being sensed by the current switch with a current level below the lowest sensing level shall be looped thru the current switch the necessary number of turns in order to activate the switch.

Computer:

Computer shall meet or exceed the following requirements:

X86_64 two or more cores
2.26 GHz
1 GB SDRAM
100 GB HDD
16x DVD ± RW with double-layer write capability
Internal 56 Kbps FAX/Modem
10/100/1000 Network Interface Card
Internal Wireless(802.11b/g 54 Mbps)
Power Supply, Battery and necessary cables and connectors
Carrying case
3-year Next-Business Day-On-Site Service Warranty.

Printer: Printer shall be laser type.

WIM Controller: WIM controllers for sorter scale and for both SWIM lanes shall be a standard product of the WIM system manufacturer. Each lane SWIM system shall have a separate controller.

SWIM Camera System: SWIM camera system component shall be as recommended by SWIM system manufacturer.

PART 3 - EXECUTION

DESIGN

The manufacturer of the WIM equipment shall be responsible for the design of the WIM system hardware and software required to accomplish the automatic and manual operation of the system specified herein.

The Lane SWIM system accuracy shall be as follows:

	Error	Standard Deviation
Single Axle Weight	±2 percent	3 percent
Tandem Axle Weight	±2 percent	2 percent
Gross Weight	±2 percent	1.5 percent
Axle space	±0.5-foot	0.5-foot
Total wheel base	±1.0 foot	1.0 foot

The WIM Sorter Scale system accuracy shall be as follows.

	Error	Standard Deviation
Single Axle Weight	±4 percent	6 percent
Tandem Axle Weight	±4 percent	4 percent
Gross Weight	±3 percent	2 percent
Axle space	±0.5-foot	0.5-foot
Total wheel base	±1.0 foot	1.0 foot

The WIM weight accuracy is defined in terms of percent error of the static weight as follows:

Percent error =
(WIM Weight – Static Weight) x 100
Static Weight

The WIM axle spacing accuracy is defined in units of feet of error to the nearest 0.1-foot as follows:

Axle spacing error = WIM Axle Spacing (ft) minus True Axle Spacing (ft)

LANE SWIM PROCESSING AND DATA COLLECTION

Each Lane SWIM system shall include all of the equipment and software necessary to calculate, store and transmit data to the State owned host computer thru a modem. The SWIM computer shall store all specified data on the hard disk.

The hard disk shall have the capacity to store all specified data for a minimum of 30,000 trucks. The hard disk shall not be susceptible to loss of accumulated data should electrical power be interrupted.

The computer shall store individual vehicle records (hereinafter referred to as "TRUCK RECORDS"). Each truck record shall include, as a minimum, the following data:

1. Time and date
2. Vehicle number
3. Speed
4. Vehicle classification
5. Weight in kips of each axle by axle number
6. Gross weight in kips
7. Spacings in feet between each sequentially numbered axle
8. Code for weight violation or violations
9. Code for invalid measurement

Data shall be calculated and formatted such that all data can be accessed and all required reports can be generated by use of the SWIM System Application Software.

The SWIM system computer's modem shall be fully compatible with the "Host Computer" modem.

WIM SYSTEM APPLICATION SOFTWARE

An application program, hereafter referred to as the "System Program," which can be run on the "Host Computer" shall be furnished as part of the WIM System. The host computer will be furnished by others.

The System Program shall provide communications between the host computer and the on-site WIM System Computer and shall process downloaded data to generate the specified reports and the specified ASCII files. Although referred to herein as a single software program, communications functions and data processing functions may be provided as two separate programs as long as all functional requirements are met. The System Program shall be "user friendly," hierarchical menu driven and shall perform the following applications:

Communications: The communications portion of the System Program shall include the following applications:

A. Real Time View:

The Real Time View application shall provide for on-line monitoring of traffic.

The display on the host computer shall depict the axle configuration of each vehicle passing through the site. The contents and format for the real time display shall be similar to the sample display contained in these special provisions.

Printing of the real time data on the host computer printer shall be facilitated by means of an on/off toggle key from the keyboard.

B. Manual Downloading: The Manual Downloading application shall provide for the downloading of selected daily data files from the storage medium of the SWIM system computer to the storage medium of the host computer. The program shall provide for a listing of the daily data files stored in the SWIM system computer and shall provide for user selection of the file or files to be downloaded from such a listing. The program shall provide for the downloading of the current day's data stored as of the time of downloading.

C. Automatic Downloading: The Automatic Downloading application shall provide for unattended downloading of daily data files stored in the WIM system computer's storage medium to the storage medium of the host computer. The program shall provide the following:

1. User's input for the date and time that unattended downloading is to begin.
2. Downloading of all daily files not previously downloaded by the Automatic Downloading application.
3. At least three attempts to make telephone connection with the WIM system computer.
4. At least three attempts to download files from the WIM system computer before aborting download.
5. Discontinuation of telephone connection after downloading of files from the WIM system computer (or after an abort) and returning the host computer to a standby mode.

D. History File: The history file application shall create a daily file which chronologically records events occurring during manual and automatic downloading sessions. Such events shall include, but not be limited to, modem result messages, start and end time of each file download and any pertinent messages generated by the program. The program shall provide for either:

1. The history file shall be in the form of an ASCII text file which can be viewed or sent to the printer; or,
2. A menu selection which shall provide for a listing of available history files and user selection of a file to be sent to the printer in the form of a report.

The communications portion of the System Program shall meet the following functional requirements:

A. Host computer's modem configuration: The program shall initialize the host computer's modem so that all necessary operating characteristics are set.

B. Baud Rate: The program will provide for operation at a minimum of 9600 baud.
C. Error Control: The program shall not in any way disable the modems' error-checking features which prevent phone-line noise from corrupting data during file downloading.
D. File Downloading Monitoring: The program shall display a window that allows the user to monitor the progress of file downloading. The program shall also provide for the abort of a file download.

Report Preparation: The Report Preparation application shall generate specified reports using the downloaded data. Such reports shall be sent to the host computer printer. The program shall prepare the following reports:

A. Distribution of vehicle classifications by hour of day.
B. Daily distribution of weight violations and invalid measurements for vehicle classification 4 through 15.
C. Distribution of weight violations by hour of day for vehicle classifications 4 through 14.
D. Distribution of overweight vehicles by hour of day for vehicle classifications 4 through 14.
E. Daily distribution of gross weights for vehicle classifications 4 through 14.
F. Distribution of 18 kip equivalent single axle loadings (ESALS) by hour of day for vehicle classifications 4 through 14. Program provides for user input of:

1. Pavement type:

(a) flexible pavement and structural number; or,
(b) rigid pavement and slab thickness.

2. Vehicle status:

(a) "all" weighed vehicles (default); or,
(b) "legal only" weighed vehicles; or,
(c) "overweight only" weighed vehicles

G. Distribution of trucks by day of month for classifications 4 through 15.

The reports shall include all information contained in and formatted similar to the sample reports contained in these special provisions. The reports shall be printed in condensed print when necessary to fit on 8 1/2" x 11" sheets.

Determination of 18 kip equivalent single axle loads shall be in accordance with the Axle Load Equivalency Factor tables contained in these special provisions.

The program shall provide for the generation of reports in the following two modes:

A. Manual Mode: The program shall provide for user selection of the date and the specific report.
B. Automatic Mode: The program shall provide for user designation of one or a combination of the specific daily reports for automatic processing. Such designations shall be effected by means of either:

1. An ASCII text file; or,
2. A menu selection which shall provide for user input of designation.

Upon selection of automatic mode of Report Preparation by the user, the program shall send to the printer all pre-designated reports for all downloaded daily data files resident with the System Program on a directory or subdirectory of the host computer's storage medium.

The designated reports shall remain in effect for subsequent automatic mode sessions unless report designation is revised by the user.

Truck Record Batch Print: The Truck Record Batch Print application shall provide for the display of, and on/off printer toggle of, individual truck records. The program shall provide for a listing of the daily truck record files available on the storage medium of the host computer and the user's selection of one of those files. The program shall also provide for the user's selection of the vehicle class or classes for which individual truck records will be displayed or printed as well as the starting hour of day.

The user shall have the following options in viewing and printing the individual truck records:

A. Scroll and print continuously all records for the selected class(es); user has capability to stop/resume scrolling or terminate program.
B. Scroll each record one at a time; user has capability to:

    1. Print displayed record and display next record.
    2. Display next record.
    3. Terminate program.

The contents and format for the truck record batch print shall be similar to the sample display contained in these special provisions.

ASCII Export Utility: The ASCII Export Utility application shall allow the user to generate an ASCII files of the daily truck records from the downloaded data. Such file will have a name which identifies the file as to site designation and date and as to its being an ASCII file. The file format shall contain all truck record fields. Such fields shall be comma delimited and padded with blanks to complete fixed logical record length

Data Files: Notwithstanding the method of data manipulation and formatting used by the SWIM system computer data files shall conform to the following:

1. Individual daily data files shall be created and stored in the storage medium of the SWIM system computer. Each daily data file shall include data for each 00:00 hour through 24:00 hour period and shall have a file name which uniquely identifies the file as to site designation, date, and file contents.

2. The daily data files shall be created at the start of each day, data for each vehicle shall be filed within one hour of the vehicle's passing through the site, and the current day's files shall be accommodative to downloading at any time during the day. Data file structure shall be accommodative to efficient use of storage medium space and rapid downloading via modem to the host computers.

3. Data shall not be lost for any vehicles passing through the SWIM system during downloading of files or other telemetry access by the host computer.

MISCELLANEOUS COMPONENTS

All necessary cabinets, interconnecting cables, flashing beacons, changeable message sign supports, axle sensor detectors, traffic loops and loop detector sensors, hardware and other miscellaneous materials and equipment, not mentioned which are required for the complete installation and proper operation of the system shall be furnished, installed or constructed.

CHARTS AND TABLES

Samples of the charts and tables required for the weigh-in-motion system are provided in the Information Handout.

12-16.15 VEHICLE MONITORING AND SIGNAL SYSTEM

PART 1 - GENERAL

This work shall consist of furnishing, installing, and connecting the vehicle monitoring and signal system (VMSS) in accordance with the details shown on the plans and these special provisions.

The VMSS shall consist of control console, truck overheight indicator, truck lane signal and inspection call system, loop detector system, programmable logic controller (PLC), variable message sign (VMS) system, public address (PA) system, closed circuit television (CCTV) monitoring system, and the associated poles and sign structures of system.

The PLC shall be as specified under the "Programmable Logic Controller" in these special provisions. The VMS system shall be as specified under the "Variable Message Sign System" in these special provisions. The PA system shall be specified under the "Public Address System" in these special provisions. The CCTV system shall be as specified under "Closed Circuit Television System" in these special provisions.

The poles and posts for the vehicle monitoring and signal system shall be as shown on the plans and shall conform to the requirements of Section 12-10-3.03, "Standard and Posts," of these special provisions.

SUBMITTALS

Manufacturer's descriptive information, catalog cuts, and installation instructions shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2 - PRODUCTS AND EXECUTION

CONTROL CONSOLE

The control console in the observation scale room shall be an oiltight console designed to house electrical components. The console shall be made from 14-gage steel, and shall contain continuously welded seams with no holes or knockouts. The cover shall contain a continuous hinge, a gasket, and captive screws for securing.

Space shall be provided at the left top portion of the control console as shown on the plans for installation of switches as required by the slow weigh-in-motion system furnished, specified elsewhere in these special provisions.

The selector switches, toggle switches, illuminated pushbuttons, piezoelectric sounder and two-color laminated phenolic plate shall be mounted on the cover of the control console. Terminal blocks and identification nameplates shall be mounted inside the console. Terminal blocks shall contain a separate, one terminal connector for each conductor entering and leaving the control console.

Selector Switches: Selector switch shall be 0.86 inch, 3 position selector switch with knob handle and maintained contact. Contact shall be rated one- ampere at 24-volt DC.

Toggle Switches: Toggle switches shall be single-pole toggle switches rated one-ampere at 24-volt DC. Toggle switches shall contain screw terminals.

Illuminated Pushbuttons: Illuminated pushbuttons shall be 0.86 inch, round, momentary contact illuminated type pushbuttons as shown on the plans. Contact shall be rated one-ampere at 24-volt DC. Pilot light shall be 24-volt DC LED lamp with the lens color and marking as shown on the plans.

Piezoelectric sounder: Piezoelectric sounder shall be 24 volt, DC operated solid state beeper capable of 55 db at 2 feet, and emitting a sound frequency of2900 Hz.

Terminal Blocks: Terminal blocks shall be 20-ampere, 300 V molded plastic with 2 or more mounting holes and 2 or more terminals in each cast block. The molded plastic shall have high resistance to heat, electrical potential, moisture, and mechanical shock and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. The identifying numbers of the terminating wires as shown on the Contractor's working drawings shall be engraved in the marking strip. Terminal blocks shall have tubular, high pressure clamp connectors.

GENERAL REQUIREMENTS

Following are the description for the control components:

General requirements: All traffic signal interlock between conflicting indication for the same lane such as "red" or "green" or between "red" and "right turn arrows" shall be accomplished with independent input signal to the PLC derived from current switches. Conflicting traffic signal such as SWIM lanes "right turn arrow" indication and static lane "green" indication shall also be interlock with independent input signal to the PLC derived from current switches. All illuminated pushbuttons pilot light indications shall duplicate the status of the item controlled. The variable message sign pilot light indications shall be energized by the current switches. Loop detectors, when referred to in the operation, shall mean that the detector is activated with a vehicle over it and output is produced in the amplifier cards. Overheight detector, when referred to in the operation, shall mean that the beam from the transmitter is interrupted, closing the normally closed contact.

1. AUTO/MANUAL/RESET SELECTOR SWITCH.--Selects automatic, reset or manual operation for overhead traffic signals and changeable message signs for SWIM lane.

    a. In automatic position, and when an overheight or a SWIM violation is detected, overhead traffic signals and the variable message signs shall be operated automatically. The message shall read "CIRCLE BUILDING TO STATIC SCALE LANE" and the traffic signal shall display a green arrow. Traffic signal and the variable message shall be subject to the control of the loops described elsewhere in these special provisions. The slow weigh-in motion controller shall provide a 24 volt DC digital input to the PLC for detection of violation in the slow weigh-in-motion lane.
    b. In manual position, all overhead traffic signals and changeable message signs are controlled by the operator, ignoring the control of the loops, overheight and SWIM signal. Static lane traffic signals and changeable message signs are operated by the operator.
    c. Reset position shall reset overhead traffic signal to green for slow weigh-in-motion lane, red for static lane, and extinguish all lane variable message signs. This shall be the default mode.

2. OVERHEIGHT SWITCH AND PUSHBUTTON.--When an overheight vehicle is detected, the "green arrow" traffic signal light shall be turn on and the variable message sign shall display "CIRCLE BUILDING TO STATIC SCALE LANE" and the pilot light in the control console shall be activated and remain lit until the illuminated pushbutton is pushed. When the overheight switch is in the "on" position, the piezoelectric sounder in the console shall sound continuously while the beam is interrupted, up to a maximum of two seconds. When the switch is in the "off" position, the overheight system shall be disconnected from the automatic operation of the SWIM system. Reset of sign and traffic signal shall conform to the requirements elsewhere in these special provisions. The PLC shall also output a momentary signal of at least 25 ms duration to the state furnished SWIM controller at 24 volt DC when an overheight condition occurs.

3. LANE VARIABLE MESSAGE SIGNS PUSHBUTTONS.--When the Auto/Reset/Manual switch is in the "Auto" position, each SWIM variable message sign pushbutton, when pushed and in conjunction with loop number 7 or 8 shall activate the first sign to display the message selected and extinguishing any other message. The message shall be turned off by the activation of loop number 10 or 11. Any message selected shall automatically be accompanied by the display of "right turn arrow" traffic signal indication, subject to the control by the loop detectors. When the Auto/Reset/manual switch is in the "Manual" position, the SWIM lane variable message sign pushbutton shall cause the sign to toggle between a message displayed or blank. Static lane variable message sign pushbutton shall toggle between a message displayed or blank.

4. TRAFFIC SIGNAL LIGHT PUSHBUTTON.--When the Auto/Reset/Manual switch is in the "Auto" position, the "right turn arrow" traffic signal light pushbutton and loop detector 5 or 6 shall activate the "green arrow" traffic signal head and remain lit until reset by the activation of loop 7 or 8 to the default mode.

5. INSPECTION CALL PUSHBUTTON.--Inspection call pushbutton shall be as specified in "Truck Lane Signal and Inspection Call System" in these special provisions.

6. SPEED LIMIT VARIABLE MESSAGE SIGN PUSHBUTTON.--Each pushbutton for the speed limit variable message sign shall cause corresponding message to be displayed in the sign. Each button shall also reset any previously displayed message.

7. LANE CLOSED TRAFFIC SIGNAL PUSHBUTTON.--The lane closed traffic signal pushbutton shall activate the red "X" signal only when the SWIM selector switch is in the "Manual" position.

8. EXIT TRAFFIC SIGNAL PUSHBUTTON.--The exit traffic signal pushbutton shall activate the red signal light at the ramp for trucks to return to the freeway. Pushing the button a second time shall extinguished the red signal. When the Auto/Reset/Manual switch is in the "Auto" position, and when a truck fails to make a right turn as directed automatically and it is sensed by loop detector number 13, 14, 15 or 16, the piezoelectric sounder in the console shall beep continuously for 5 seconds

9. Piezoelectric sounder.--A piezoelectric sounder shall beep a maximum two seconds for overheight truck if the overheight switch is on, three seconds for SWIM violation, and 5 seconds when a truck fails to make a right turn as directed either automatically or manually and it is sensed by loop detector number 13, 14, 15 or 16.

TRUCK OVERHEIGHT INDICATOR

Truck overheight indicator shall be an automatic overheight indicator system consisting of infrared energy transmitting devices, infrared energy receiving devises, and suitable control units for detecting overheight vehicles. The infrared beam for the center SWIM lane shall be arranged in such a way that it is on the opposite side of the post from the infrared beam of the outside SWIM lane and inside static scale lane. The infrared beam going in the same direction, shall be locked at the nearest point to prevent false signal from reaching the receiver of the other lane. Blocking metal plate shall be1.5 times larger than the projected field of view.

Transmitter and receiver shall have NEMA Type 4 enclosure. The height gage transmitter and receiver shall be 120-volt, AC, 60 Hz and shall operate with minimum excess gain of 600 at a separation 25 ft. Operating temperature shall be -19˚F. to 120˚F. Each height gage receiver shall contain a relay with 2-pole, double-throw (DPDT), 5-ampere, 120-volt AC contacts. The receiver shall be immune to 10,000 foot candles of sunlight.

All control components of the truck overheight indicator shall be mounted in the VMSS section of the SWIM system control cabinet as shown on the plans.

TRUCK LANE SIGNAL AND INSPECTION CALL SYSTEM

The traffic in each of the lanes shall be controlled by individual 3-section traffic signal heads vertically centered over their respective lanes and mounted on the signal and weight display pole; and by individual lane closure signal (red "X" signals) centered over their respective lanes and mounted on the Sign Bridge No. 1. The traffic near the exit shall be controlled by a one-section traffic signal head mounted on the exit signal and speaker pole. The traffic at the entrance and exit of each inspection bay shall be controlled by two-section traffic signal heads mounted on the overhead door wall. The truck inspection call system shall consists of inspection call illuminated pushbuttons. The traffic signals shall conform to the requirements of Section 86-4, "Traffic Signal Faces and Fittings," of the Standard Specifications.

The traffic signal sections shall use light emitting diode signal modules as specified under "Light emitting Diode" in these special provisions. Each traffic lane traffic signal shall contain three, 12-inch sections arranged vertically with red-top, green arrow-center and green bottom. The green arrow shall be arranged to show right turn. The exit signal shall contain one, 12-inch section with red lens color. Each inspection bay overhead door traffic signal shall contain two 8-inch sections arranged vertically with red and green color lens without backplate.

Inspection call system shall consist of four circuits of illuminated call pushbuttons, one for each inspection bay. Each circuit consists of two buttons, one at the inspection bay inspector’s control station and one at the control console. When the inspector in a lane is ready to call for a truck to be inspected, he pushes the illuminated pushbutton which provides a call light at both locations. When the scale operator sends a truck to that lane, he pushes his illuminated pushbutton to extinguish the call lights at both locations.

The inspection call pushbuttons are provided for in the control console in addition to the inspection call pushbuttons specified below.

The inspection call pushbuttons shall be installed at the inspector's control station at each bay as shown on the plans. Each pushbutton shall be in a cast metal box and shall be 0.86 inch oil tight, industrial, illuminated pushbutton with 24-volt, DC LED pilot light and 1-ampere contact at 24-volt, DC.

Control equipment for truck lane signal and inspection call system except for the overhead door traffic signals shall be mounted in the VMSS section of the SWIM system cabinet as shown on the plans.

LOOP DETECTOR SYSTEM

Loop detectors shall be as specified under "Weigh Station Bypass System" except loops for VMS shall be 6 foot loops.

12-16.16 PROGRAMMABLE LOGIC CONTROLLER

PART 1 - GENERAL

The programmable logic controller (PLC) shall include a power supply, central processor unit (CPU), input and output modules (I/O), expansion chassis, complete control system programming for all controls including all necessary software, and all necessary interconnecting cables.

The input and output system of the PLC shall include all components of the truck height indicator, truck lanes traffic signals, inspection call system, control console and changeable message signs system. The input and output system shall have a logical control between all components functions of the system as describe elsewhere in these special provisions.

The programming device for the PLC shall be an IBM compatible lap-top computer with ladder logic programming software. The laptop computer shall be furnished with all the necessary interfacing devices and cables to connect to the PLC for programming. Laptop computer shall have a serial and parallel port.

TRAINING

Training of State personnel in programming, connection, operation, trouble shooting, and maintenance of the programmable logic controller shall be provided. The training period shall be for a minimum of 2 days and shall be conducted for not more that 8 State personnel at the job site. The trainer shall be an authorized representative of the PLC manufacturer, shall have complete knowledge of PLC installation and operation, and shall be qualified as a trainer.

All trainees shall be supplied with books, manuals, programmer or personal computer, software, and such other training material, guides and equipment, not mentioned, but required for a complete and thorough training course. Training shall include hands-on experience in programming techniques and operation.

MANUFACTURER'S TECHNICAL SUPPORT

The manufacturer of the programmable logic controller shall provide technical assistance and guidance in the operation, maintenance and trouble shooting of operational problems for the PLC system for one year following the acceptance of the contract. The technical support shall be provided at no additional cost to the State.

Technical support shall be provided at the facility site by an authorized representative of the PLC manufacturer and by a toll free telephone service to the manufacturer.

PART 2 – PRODUCTS AND EXECUTION

Programmable Logic Controller:

The programmable logic controller shall include a power supply and a central processor unit (CPU) that operates at 120-volts, 60 Hz AC line voltage. The controller shall be capable of operating in the following environmental conditions:

1. Operating temperature: Between 32ºF and 131ºC.
2. Humidity: 20 to 90 percent non-condensing.
3. Vibration: 16.7 Hz, 0.10-inch, peak to peak.
4. Shock: 10G, 3 times in each axis(X, Y and Z).
5. Noise immunity: 1,500 volts, NEMA showering arc.

The PLC shall be installed in the VMSS section of the SWIM system control cabinet as shown on the plans.

Input and Output Modules: The input and output (I/O) modules shall be the discrete or analog type as necessary. The I/O modules shall be capable of being plugged into the expansion chassis in any slot. Each module shall have a keyed plug in the terminal strip for each type of module for ease of replacement of the module without having to disturb the wiring connection. Each terminal strip shall have a marking strip under a clear plastic cover for inscribing the wire identification. Each I/O module shall have LED indicators to show when each input is turned on or when an output occurs. Each I/O module shall operate at the voltage level of the connected devices and shall have a noise immunity of 1,500 volts NEMA showering arc. Analog output shall have the current or voltage level output required by the connected equipment.

Lap-top Computer:

The lap-top computer shall meet or exceed the following requirements:

Dual core processor
2.26 GHz
2 GB SDRAM
100 GB HDD
16x DVD ± RW with double-layer write capability
Internal 56 Kbps FAX/Modem
10/100 Network Interface Card
Internal Wireless (802.11b/g 54 Mbps)
PLC Programming software/Tool kit
Any necessary software for programming and communication with supplied PLC
Power Supply, Battery and necessary cables and connectors
Carrying case
3-year Next-Business Day-On-Site Service Warranty.

12-16.17 VARIABLE MESSAGE SIGN

PART 1 - GENERAL

Scope: This work shall consist of furnishing and installing lane variable message signs, speed limit variable message signs, and sorter WIM scale traffic signal head (Red X and Green arrow) all in accordance with the details shown on the plans and these special provisions.

The measurement and payment clauses of the referenced Standard Specifications shall not apply. Full compensation for the work referenced therein shall be considered as included in the contract lump sum price paid for weigh station message sign and no additional compensation will be allowed.

The variable message signs shall be the Light Emitting Diode (LED) type and shall consist of the following:

1. Weatherproof, corrosion resistant, sign housing.
2. Light emitting diode type light source complete with all controls inclusive of dimming controls ranging from 100% output to 1% output.
3. Electrical and electronic control components, wiring and interconnections complete with fully protected power supplies, terminal blocks, fuses, and disconnect switches.

Each variable message sign shall be capable of displaying the messages as shown on the plans. Changes from one message to another shall take place so that the motorist only visualizes the complete and intended message on the sign face, at any one time. All lines of text shall energize and de-energize simultaneously. The sign messages shall be clearly visible in all lighting conditions, including direct and back sunlight. The sign shall not be readable when de-energized. The sign shall be capable of operating between temperature ranges of -35 Degree F to +165 Degree F.

SUBMITTALS

Manufacturer's descriptive data, catalog cuts, structural calculations for VMS housing design and sign mounting mechanism, orientation with respect to the roadway, and installation instructions shall be submitted for approval.

Working drawings for the VMS housing and mounting details shall be submitted for approval. Working drawings shall show the shape, size, thickness, and method of attachment for each component used in the work.

PART 2 - PRODUCTS

Sign Housing:

Sign housing shall be weatherproof, corrosion resistant and shall utilize clear natural finish aluminum material. The sign LEDs aluminum mounting plate shall be completely covered with UV stabilized polycarbonate protective lens. The housing shall have drainage holes, screened ventilation louvers to facilitate natural cooling and be capable of accepting the mounting as shown on the plans. All openings shall be sealed or gasketed to prevent moisture and dirt from entering the interior of the sign.

An inspection door shall be provided to enable easy access for maintenance purposes. Inspection door shall be accessible at the front of the sign. The door assembly shall include a device to hold the door in the open position during servicing or inspection. Screws, washers, nuts, and bolts for the housing shall be stainless steel. All other components shall be corrosion resistant.

The sign housing structural elements shall be designed to withstand a minimum wind velocity of 100 miles per hour.

Sign LED System:

Individual characters shall be formed by pixels. Each pixel shall be double stroke luminous dot. Each luminous dot shall be made up of white 0.2-inch diameter LED mounted directly to the aluminum sign face. The intensity of emitted light shall increase axially. The distance between adjacent pixels shall be as determined by the manufacture to achieve the desired visibility and in a manner so that the characters are viewed unbroken and continuous. When the VMS is illuminated, the visible height of letters shall be 6 inches as determined by the National Transportation Communication Interface Protocol (NTCIP) document 1203:1997.

The white LEDs shall have luminous intensity of no less than 4900 milli-candala (mcd) when viewed at an angle of 30 degrees. The white LEDs shall employ phosphor technology and shall have degradation of no more than 20% when in operation for over 50, 000 hours.

Sign Electrical Wiring and Interconnections:

Signs electrical/electronic components shall be of modular construction allowing replacement of defective parts without the use of soldering iron. The signs electrical/electronic system shall be suitable for 120-volt input power and shall be capable of receiving and delivering two continuous 120-volt rated inputs and outputs. Upon receipt of a given input, the sign control shall illuminate corresponding output message and turn ON corresponding output in the form of FORM C contact for remote monitoring.

The LED circuitry shall consists of two main sub-circuits; the sign power circuit and the LED power bus system circuit. The power circuit shall be suitable to be supplied with 120-volt power and it shall employ mechanism to protect the system components from power surges and internal short circuits. The power supply system shall be designed to maintain regulation over the supplied voltage of 90-130 volts range. The LED power supply system shall consists of identical power supplies arranged in a fashion to supply isolated output voltage only to selected LED characters and control voltage for control chips and sensing. Each power supply shall be rated to supply all pixels with in a group of character plus 20% extra during daytime operation. The individual power supply shall receive their control signal via an interface board that monitors the incoming controls for activation of the sign message. Each output channel of the power supply shall be thermally protected and shall shutdown the output channel upon detection of overload condition. Upon clearing of the overload the channel shall be able to return to full operation undamaged.

For improved night visibility, the light output of the LED type sign shall be reduced. The reduction of the light output shall be accomplished by a microprocessor that continuously monitors a photodiode mounted on the signs aluminum faceplate and then signal power supply units to regulate their output to adjust brightness in response to ambient light conditions..

Each conductor/cable shall be individually and clearly labeled with permanent markings. The system for marking internal sign conductors/cables shall allow a maintenance person to identify the function associated with any specific cable.

A GFCI receptacle outlet connected on one circuit rated for 120 V, 15 A shall be installed for service personnel use in the sign housing. The GFCI receptacle housing shall be suitable to be installed in the sign.

All wires entering or leaving the VMS including internal wires shall be terminated on screw type terminal blocks. All terminal blocks shall be accessible for servicing. All internal sign wiring excluding field wiring shall be done at the place of manufacturing of the VMS.

PART 3 - EXECUTION

Each VMS sign shall be mounted rigidly and securely in accordance with the manufacturer’s recommendations. The VMS shall be tilted and oriented in a manner so that the sign is clearly legible to truck drivers.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the units.

All control components of the VMS system shall be mounted within the sign housing that is accessible from the front of the sign.

FIELD QUALITY CONTROL

Testing: The operational test for the VMS system shall be performed by the Contractor in the presence of the Engineer. The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and demonstrate system stability under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

DEMONSTRATION

Training: The Contractor shall provide 2 hours of on-site training on the use, operation, and maintenance of the VMS system for not more than 6 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of the proposed training class.

12-16.18 PUBLIC ADDRESS SYSTEM

PART 1 - GENERAL

The public address (PA) system shall include control panel, speakers, amplifier, desk stand type microphone with built-in speaker control and interconnecting cables.

SUBMITTALS

Manufacturer's descriptive information, catalog cuts and installation instructions shall be submitted for approval.

PRODUCTS AND EXECUTION

Public Address System Control Panel

The PA system control panel shall be a surface mounted NEMA Type 12 control panel enclosure conforming to the Joint Industrial Conference Standards. The enclosure shall be made of 14 gauge steel minimum with all seams continuously welded. The enclosure shall contain an electrical mounting panel and a hinged door with flush latch handle. The control relays, attenuators, fuse, power supply, duplex plug receptacle and terminal blocks shall be mounted on the panel in the enclosure.

Control Relays

Control relays, CR1 through CR4 shall be 24-volt, DC relay with 24-volt coil and 2-pole, double throw contacts. Coil of the relay shall have a diode suppressor.

Power Supply

Power supply shall be 120-volt AC fused input and 24-volt DC, 2-ampere output. The unit shall have less than 2.5 per cent ripple at full load.

Attenuators

Attenuators shall be autotransformer type and shall meet the following requirements:

Power rating:	30 watts
Positions:	eleven (10-off)
Attenuations/step:	3 dB

Duplex Plug Receptacle

Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors.

Fuse

Fuse shall be 30-volt DC, 2-ampere complete with fuse holder.

Terminal Blocks

Terminal blocks shall be 20-position, 5 A, 300 V molded plastic with 2 or more mounting holes and 2 or more terminals in each cast block. The molded plastic shall have high resistance to heat, electrical potential, moisture, and mechanical shock and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. The identifying numbers of the terminating wires as shown on the Contractor's working drawings shall be engraved in the marking strip. Terminal blocks shall have tubular, high pressure clamp connectors.

Amplifier

The amplifier shall be of completely solid-state circuitry and shall have an integral power supply. The amplifier shall be designed for shelf mounting and shall be housed in metal cabinets. Each amplifier shall meet or exceed the following requirements:

Power output:	120 watts (RMS)
Distortion:	Less than 2 per cent
Frequency response:	50 Hz to 10 kHz + 2 dB
Noise level:	58 dB below rated output (Microphone input)
Sensitivity:	Full output with 0.3 millivolt input from microphone
Output impedance:	4, 8, 16 ohms and 70 volts
Primary voltage:	120 V, AC, 60 Hz
Protection:	Amplifier shall have built-in protection against shorted or open speaker lines and shall have an adequate AC input line fuse.
Controls:	2 microphone gain, one auxiliary gain, bass and treble control
Inputs:	2 microphone, low impedance 150 to 250 ohm, one auxiliary.

Microphone

The microphone shall be the dynamic or moving coil type and shall be furnished with a desk stand providing four 3-position switches for lane speakers control with center-off. Microphone case and desk stand shall be of metal construction.

The microphone shall be provided with a 8-conductors cable with 2-conductors shielded. The microphone shall meet or exceed the following requirements.

Output level:	Minus 59 dB/1 mW/10
Frequency response:	60 Hz to 10 kHz
Impedance	150-250 ohms
Polar pattern	Cardoid

Speakers

Each speaker furnished and installed for the public address system shall be the weatherproof, metal horn type and shall be furnished with adjustable swivel mounting brackets. Each speaker shall meet or exceed the following requirements:

Power rating:	30 watts
Frequency response:	250 Hz to 10 kHz
Dispersion:	120 degrees
Sound pressure level:	120 dB @ 4 ft @ 1kz on axis at rated output

A weatherproof, 70-volt transformer shall be installed at speakers for level setting. Transformers shall have multi-primary taps to permit various power settings up to 30 watts.

Speaker Cables

Speaker cables shall be 2-conductor, No. 14 stranded, with spiral copper shield foil and copper drain wire and plastic jacket suitable for underground use.

12-16.19 CLOSED CIRCUIT TELEVISION SYSTEM (CCTV)

PART 1 - GENERAL

Closed circuit television (CCTV) system shall be color type consisting of camera assemblies, monitors, transmitters, fiber optic cables, fiber optic/video converters, and such other equipment required by the CCTV manufacturer to install a complete system without any extra charge to the State. The number of components shall be as shown on the plans.

SUBMITTALS

Manufacturer's descriptive information, catalog cuts, block diagram and installation instructions shall be submitted for approval. Block diagram shall include all cables and components of the system.

PART 2 - PRODUCTS AND EXECUTION

Camera Assembly

Each camera assembly shall be assembled and tested in accordance with these specifications prior to delivery to the jobsite. Camera assembly shall include camera, lens, pan and tilt, and camera video transmitter. The complete camera assembly shall be enclosed in a single weatherproof enclosre. Factory testing documentation shall be furnished to the Engineer. Camera assemblies shall be delivered to the jobsite as complete unit.

The camera shall meet or exceed the following specifications:

a. High resolution, 1/3 inch CCD (charged coupled device) color camera.
b. Signal format shall be compatible with SMPTE-170 standard.
c. Color balance shall be of the through-the-lens type, with less than 10 IRE units unbalance from 2850 to 5800°K.
d. The minimum number of picture elements shall be 768(H) by 494(V) pixels.
e. Video output signal shall be Standard Video output level shall be 1.0 V p-p (75 ohm composite).
f. Minimum video sensitivity of 0.1 footcandle.
g. Camera resolution shall be a minimum of 460 horizontal television lines and a minimum of 350 vertical television lines when measured from the camera video output.
h. Signal-to-noise ratio shall be better than 48dB at 1.0 V p-p (with standard automatic gain control off and 1.5 footcandle).
i. Gamma shall be 0.45.
j. Camera shall operate on 115 V, AC, 60 Hz.
k. Power consumption with heater off shall be less than 10 watts. Power consumption with heater on shall be less than 20 watts.
l. Camera shall be capable of integrating multiple frames for increased sensitivity.

The camera shall be specifically designed to operate under low light conditions and shall function satisfactorily over a wide range of dynamic lighting conditions ranging from low light to full sunlight.

The camera shall have a built-in programmable electronic circuit character generator capable of superimposing a written camera identification message over the video display. The identification shall be programmable up to two lines of 24 characters per line. Text characters shall be white with a black border 28 horizontal TV lines in height. The camera identification shall be input via an EIA-422 connector to the camera housing programmable from a computer or a dumb terminal. The character generator shall also superimpose a message indicating that the camera pressure is low if the pressure in the enclosure drops to 2 psi and below.

The camera lens shall be motorized with automatic iris and manual override. The iris shall be controlled directly by the camera in automatic mode and from the control receiver in manual mode. Each lens shall incorporate an intra-spot neutral density filter and shall meet the following requirements:

Standard "C" type mount, 1/3inch format.
Focal length of 4 to 48 mm providing a 12:1 power zoom ratio.
Maximum aperture of no less than F1.2.
All lens motors shall be slipclutch protected to prevent damage due to overload.
The lens must incorporate optical image stabilization.

The complete camera assembly shall meet or exceed the following environmental specifications:

Temperature	-40 to 140ºF
Humidity	100 percent relative humidity
Vibration	Swept 5-60 Hz, 0.082 " amplitude (15 G's at 60 Hz)
	Random 60-1000 Hz 5G's RMS
Shock	Up to 30 G's any axis under nonoperating conditions
	MIL –E-5400T, para 3.2.24.6
Sand & Dust	MIL –E-5400 T, para 3.2.24.7
Fungus Salt	MIL –E-5400 T, para 3.2.24.8
Atmosphere	MIL –E-5400 T, para 3.2.24.9
Explosion	MIL –E-5400 T, para 3.2.24.10
EMI	FCC Rules, part 15, subpart J for Class devices
Acoustic Noise	+150 dB

A sunshield shall be supplied and installed on all the cameras to protect the camera from direct sunlight. It shall be constructed in such a way as to allow the free passage of air between the housing and the shield, but shall not form a "sail" to place an excessive load on the pan and tilt unit in high winds.

The pan and tilt shall meet the following specifications:

1. The travel angle of the pan and tilt drive unit shall be 350 degrees minimum in the horizontal plane and ± 90 degrees in the vertical plane. Position of camera stops shall be approved by the Engineer.
2. The pan and tilt unit shall provide positional feedback through an internal potentiometer to accommodate preset positions, controlled from the multiprocessor control units and transmitter/receiver control box.
3. The pan and tilt unit shall pan at a nominal speed of 5 to 10 degrees per second, and a nominal tilt of 2 to 4 degrees per second.
4. The pan and tilt unit shall have immediate reverse motor action. Dynamic braking shall also be incorporated to prevent drift.
5. The bottom of the pole mount camera assembly shall have a single MS-series connector, with all power, control, data, and video.

The camera video transmitter transmits video and control data and responses on a singlemode fiber optic cable. The transmitter must be no larger than 1-1/2" x 2" x 4". The video input shall be BNC. The data to and from the camera/lens/pan/tilt assembly shall be a DE-9 and TIA-422. The fiber optic connection shall be SC.

CCTV Transmitter

The pan and tilt control shall consist of a joystick to move the camera to the left, right, up or down positions. The zoom lens control shall have the following: Zoom-Tele/Wide; Focus-Near/Far; Iris-Open/ Close. Lens speed shall be controlled from slow to fast with a rotary knob. The power On/Off switch shall be a rocker type switch. The transmitter shall allow control to be switched to any one of the cameras.

Fiber Optic/Video Converter

The fiber optic/video converter takes up to 6 SMPTE-170 video inputs and displays them on a single high resolution screen all at the same time. Video output shall be 1280 x 1024 @ 60Hz on a 15-pin VESA connector. A dip switch on the back will select the inputs sent to the display.

Monitor

Monitor shall be liquid crystal display (LCD) monitor with 19 inches active thin film transistor (TFT) type monitor with multimode functionality and shall meet or exceed the following:

A. LCD panel pixel array shall be not less than 1280 x1024
B. Panel aspect ratio shall be 4:3 composite.
C. Viewing area shall be not less that 14:8 inches x 11.2 inches.
D. Brightness shall not be less than 35.3 cd/ft square
E. Contrast shall be not less than 500:1.
F. Panel lamp life shall be not less than 40,000 hours.
G. Viewing angle (horizontal/vertical) shall be 150-130 degrees.

H. Tilt shall be 10-45 degrees and display colors shall be not less than 16.7 million.
I. Response time shall not be more than 8 ms.
J. Indicators shall be LED (power on, standby, sleep), on screen.
K. Input voltage shall be 120 VAC, 60 Hz, with internal power supply.
L Power consumption shall be less than 50 W (on) and less than 5 W (standby).
M. Video input interface shall be VESA 15-pin
N. Vertical frequency shall be 56 Hz-75 Hz.
O. Operating humidity shall be 20percent-85 percent, non-condensing.
P. Operating temperature shall be 32ºF to 104ºF

Cables, Connectors and Harnesses

Units or assemblies which require 120-volt AC power for operation shall be furnished with a 6 foot long, 3-conductor power cable permanently affixed to its chassis or enclosure at one end in a manner so that it is fully protected from contact with metal edges. The chassis or the enclosure shall have a strain relief device to prevent strain on each internal connection to the power cable.

All external connections shall be made by means of connectors. The connectors shall be keyed to preclude improper hookups. All wires to and from the connectors shall be color coded and/or appropriately marked. In order to assure compatibility and performance compliance, the cables from the camera and pan and tilt unit shall be assembled by the camera manufacturer.

Connecting harnesses of appropriate length and terminated with matching connectors shall be provided for interconnection with the communications system equipment.

All pins and mating connectors shall be plated to provide good electrical connection and resist corrosion. Connectors utilizing solder type connections shall have each soldered connection covered by a piece of heat shrink tubing securely shrunk to insure that it protects the connection.

All connectors shall be provided and installed which are compatible with the communications equipment interface. Connectors shall be used for connections at the camera/lens enclosure and pan/tilt positioning system. All connector pins and mating connectors shall be plated to ensure good electrical connection and resist corrosion. Pressure tight multi-conductor ms-type cable connectors shall be used for camera connections.

Installation

CCTV system shall be installed as shown on the plans. Cameras and monitors shall be adjusted for both day and night operations. The Contractor shall submit the installation and mounting details of the cameras. The system shall be installed at locations shown on the plans and by methods recommended by the manufacturer. The Contractor shall provide all supports, fasteners and other hardware necessary to support the units.

Training

The Contractor shall provide one hour of on-site training on the use, operation, and maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

FIELD QUALITY CONTROL

Testing and Documentation

Prior to conducting any tests the Contractor shall provide the Engineer detailed test procedures for review and approval. Documentation of all test results shall be provided to the Engineer for review and approval. System Documentation shall incorporate test results for ongoing maintenance and performance measurements.

CCTV Control Location Tests

In the presence of the Engineer, the Contractor, after installation of the CCTV, shall verify the correct operation of the camera and pan and tilt drive units. These tests shall include:

1. Viewing video images as the lens focal lengths and apertures of the lens is varied from the multiprocessor camera control, master and remote locations. The Contractor shall verify that the camera is focused after each change.
2. Verifying the correct operation of the auto iris, power zoom and imager protection features from the multiprocessor camera control, master and remote locations.
3. Verifying the correct operation of the pan and tilt from the multiprocessor camera control, master and remote locations.

The Contractor shall have a representative present during all phases of testing, who is capable of troubleshooting Contractor installed equipment. The representative shall troubleshoot Contractor installed equipment as the need arises. All of the work described herein shall be considered paid as part of the CCTV installation.

Final CCTV Test

In the presence of the Engineer, the Contractor shall conduct a final test of the CCTV system to verify the system is complete and fully operational. The Contractor shall conduct end to end performance tests on the CCTV system. These tests shall confirm the functional operation of all elements of the system and shall include measurements of the system performance.

Each camera shall be tested to measure the video signal received using a NTSC waveform monitor. The testing shall confirm video levels and signal to noise ratio specification compliance for daytime and nighttime operation at each of the camera locations. The pan and tilt shall be functionally tested over 350 degrees in the horizontal plane and ± 90 degrees in the vertical plane. Functional testing shall also confirm specification compliance for the lens operation, the auto and manual iris control, and the camera receiver and transmitter.

12-16.20 TRUCK STATIC WEIGHING ELECTRICAL SYSTEM

PART 1 - GENERAL

Scope**:** This work shall consist of furnishing and installing a truck static electronic weighing system in accordance with the details shown on the plans and these special provisions.

The truck scale static electronic weighing equipment shall include a weighmeter, printer, remote weight display, load cells and load cell summation box. The system shall be complete with interconnecting cables.

PART 2 - PRODUCTS

Weighmeter: The weighmeter shall incorporate filtering against effects of radio frequency and electromagnetic interferences such as those generated by electromechanical equipment, power lines, portable hand-held radio transmitters and citizen band transmitters. The weighmeter shall display accurate axle weights of vehicle moving over the scale platform at a speed of 3 mph or slower. The weighmeter shall provide, on command to printer, the following information:

1. Individual axle weight.
2. Time and date.
3. Total of all axle weights.
4. Truncated weight information in 20-pound increments.

Operator control of the weighmeter shall include the following:

1. Time and date setting.
2. ON-OFF selector switch for remote weight display.
3. Axle weight "Print" pushbutton actuator.
4. Tot
5. ON-OFF switch for an internal overload alarm.

The weighmeter shall also meet or exceed the following requirements:

Power requirements	120-volt AC, 60 Hz
Operating temperature	32˚ to 120˚ degrees F.
Full scale range	99980 pounds
Counting increments	20 pounds
Polarity indication	Auto minus shall illuminate when reading is below one increment or more.
Overload audio alarm	Presettable overload indication for internal audio alarm. Alarm shall come on when the weight on the scale platform exceeds the preset weight.
Pounds for kilograms	Direct arithmetic conversion by front panel pushbutton switch.
Pushbutton zero	Automatically zeros weighmeter display interlocked with motion detector.
Auto-zero tracking	Automatically tracks zero to ensure a stable zero. Tracking range shall be internally selectable.
Numeric keyboard	Provide manual entry of all functional data.
Function key	Appropriate number of preassigned function keys for special control functions.
Status key	Display weighmeter status mode, center zero, and motion.
Load cell excitation	Power up to 4 load cells at 15 volts AC or DC.
Dead load	Field adjustable from 0 to 74 percent
Back up battery	Retain data memory during power failure
Auxiliary output	Shall interface with the following: a. Remote weight display. b. Printer c. Presetting an overload capacity on scale, when the truck reaches this preset point, an alarm will sound
Auxiliary input	Shall interface with following command devices from auxiliary equipment; a. Mode, zero, net. gross pushbuttons. b. Remote display ON/OFF selector switch. c. Axle weight "Print" pushbutton. d. Total of axle weights "Print" pushbutton.
Display	Light emitting diode main and auxiliary display. Main display shall be 0.5 inch or more in height with 6 digits. Auxiliary display shall be 0.2 inch or more in height, with alpha-numeric characters.
Enclosure	Countertop, all metal NEMA 1 enclosure with front enclosure of 2.5 inches maximum, a back enclosure height of 5.25 inches maximum, and a depth of 11.5 inches maximum with front control panel sloped at 60 degrees to the countertop.

The weight of each axle and the total accumulated weight of all previous axles shall be displayed on the weighmeter. When the "TOTAL" command is entered, all preceding axle weights shall be displayed on the auxiliary display for an additional two seconds after which the accumulator shall automatically reset to zero.

The weighmeter, including the enclosure, shall be standard manufacturer catalog item with the required modification specified above.

Printer: Printer shall be fully microprocessor controlled printer with dot matrix print head and alpha-numeric characters. The printer shall be under the manual control of the weighmeter with pushbuttons for "PRINT" and "TOTAL" commands during each weighing, either static or dynamic. When the "PRINT" command is entered, whatever weight is displayed on the weighmeter at that time shall be printed. When the "TOTAL" command is entered, all preceding axle weights and the date and time shall be printed on each weight ticket. The printer shall not interfere with the normal weighing and indicating mechanisms of the scale. The printer shall meet or exceed the following requirements:

Power requirements	120-volt AC, 60 Hz
Control	ON-OFF switch
Character height	0.105-inch, minimum
Print speed	One or more lines per second
Line spacing	6 lines per inch
Roll paper width	Standard office supply paper
Paper thickness	One or two ply (0.003-inch to 0.007-inch)
Roll paper diameter	3.25-inch
Data input	Compatible with data output of weighmeter
Operating temperature	Plus 30 degrees F. to plus 120 degrees F.
Axle sequence number	Automatically reset to zero for each vehicle

Load Cells: Load cells shall be the tension or compression type load cell with mounting assembly and shall meet or exceed the requirements contained in the National Bureau of Standards Handbook 44, "Specifications and Tolerances." Load cells shall be temperature compensated for thermal changes to assure accurate zero and span output, environmentally sealed against dust and moisture, and barometrically insensitive to barometric changes. Load cells shall be of high strength alloy steel construction and shall meet or exceed the following requirements:

Capacity	25 Tons
Safe overload	150 percent
Zero balance	±1 percent of full scale
Maximum excitation	15-volts AC or DC
Non-linearity	0.05 percent of full scale
Hysterisis	0.30 percent of full scale
Non-repeatability	0.02 percent of full scale

Remote Weight Display: Remote weight display shall be an outdoor, display with six numerals. The sixth digit at the right shall be a fixed zero. Numerals shall be minimum 5.5 inches high, double-stroke, LED type yellow display. Numerals shall show against a flat background. The enclosure shall be NEMA Type 4X, fully gasketed and watertight. The external digital weight display shall precisely track the weighmeter display and operate on standard 120-volt, 60 Hz, AC power. The unit shall operate satisfactorily in a temperature range between 32 degrees F. and 120ºF. and shall have a single -pole, single throw selector switch to turn on and off the power.

Interconnection Cables: All interconnection cables between the scale electronic equipment shall be of the type recommended by the equipment manufacturer.

12-16.21 LIGHT EMITTING DIODE SIGNAL MODULE

GENERAL

Summary

This work includes installing LED signal module. Comply with Section 86, "Electrical Systems," of the Standard Specifications.

Use LED signal module as the light source for the following traffic signal faces:

1. 12-inch section
2. 8-inch section
3. 12-inch green arrow section
4. 12-inch lane control section

Submittals

Before shipping LED signal modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED signal module serial numbers anticipated for use
3. LED signal modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

http://www.dot.ca.gov/hq/esc/approved_products_list

The State will test LED signal module shipments as specified in ANSI/ASQ Z1.4. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED signal modules tested or submitted for testing must be representative of typical production units. LED and circular LED signal modules will be tested as specified in California Test 604. Arrow, U-turn, and bicycle LED signal modules will be tested as specified in California Test 3001. All parameters of the specification may be tested on the modules. LEDs must be spread evenly across the module. LED arrow indication must provide the minimum initial luminous intensity listed. Measurements will be performed at the rated operating voltage of 120 V(ac).

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED signal modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After testing, you must pick up the tested LED signal modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to State Maintenance Electrical Shop at 175 W. Cluster Street, San Bernardino, CA 92401.

MATERIALS

Minimum power consumption for LED signal module must be 5 W.

LED signal module must have an operational lifecycle rating of 48 months. During the operational lifecycle, LED signal module must meet all parameters of this specification.

LED signal module must be designed for installation in the door frame of standard traffic signal housing.

LED signal module must:

1. Be 4 pounds maximum weight
2. Be manufactured for 12-inch circular, 8-inch circular, arrow, U-turn, bicycle, and lane control section
3. Be from the same manufacturer
4. Be the same model for each size
5. Be sealed units with:

    5.1. 2 color-coded conductors for power connection, except for lane control LED signal modules use 3 color-coded conductors.
    5.2. Printed circuit board and power supply contained inside and complying with Chapter 1, Section 6 of TEES published by the Department.
    5.3. Lens that is:

        5.3.1. Integral to the units
        5.3.2. Convex or flat with a smooth outer surface
        5.3.3. Made of UV stabilized plastic or glass, and withstands UV exposure from direct sunlight for 48 months without exhibiting evidence of deterioration

    5.4. 1-piece EPDM gasket

6. Include 3-foot long conductors with quick disconnect terminals attached
7. Be sealed in door frames
8. Fit into existing traffic signal section housing and comply with ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads"

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string must not result in loss of entire string or other indication.

No special tools for installation are allowed.

12-inch Lane Control

Combination module with a red X and green arrow. Approximate shape and size for lane control modules is shown on the plans. Conductor function and color code must be as follows:

Conductor Function and Color Code

Function	Color
Neutral	White
Red X	Red
Green Arrow	Brown

LED signal module must:

1. Be weather tight and connect directly to electrical wiring.
2. Be capable of optical unit replacement.
3. Be a single, self-contained device, ready for installation into traffic signal housing.
4. Have manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics, including rated voltage, power consumption, and volt-ampere, permanently marked on the back of the module.
5. Have a symbol of module type and color. Symbol must be an inch in diameter. Color must be written out in 0.50 inch high letters next to the symbol.
6. Be AlInGaP technology for red and yellow indications and gallium nitride technology for green indications.
7. Be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
8. Have a maximum power consumption as follows:

Power Consumption Requirements

LED Signal Module Type	Power Consumption (Watts)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
12-inch circular	11	17	22	25	15	15
8-inch circular	8	13	13	16	12	12
12-inch arrow	9	12	10	12	11	11
Lane Control (Arrow)	--	--	--	--	11	11

Lens may be tinted, or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. Tinting or other materials to enhance "ON/OFF" contrast must not affect chromaticity and must be uniform across the face of the lens.

If polymeric lens is used, surface coating or chemical surface treatment must be applied for front surface abrasion resistance.

Power supply must be integral to the module.

Internal components must be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Lens and LED signal module material must comply with the ASTM specifications for that material.

Enclosures containing either the power supply or electronic components of LED signal module, except lenses, must be made of UL94VO flame-retardant material.

If a specific mounting orientation is required, the LED signal module must have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing. Markings must include an up arrow, or the word "UP" or "TOP."

LED signal module must meet or exceed the following values when operating at 25 °C:

Minimum Initial Intensities for Circular Indications (cd)

	8-inch			12-inch		
Angle (v,h)	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	157	314	314	399	798	798
2.5, ±7.5	114	228	228	295	589	589
2.5, ±12.5	67	133	133	166	333	333
2.5, ±17.5	29	57	57	90	181	181
7.5, ±2.5	119	238	238	266	532	532
7.5, ±7.5	105	209	209	238	475	475
7.5, ±12.5	76	152	152	171	342	342
7.5, ±17.5	48	95	95	105	209	209
7.5, ±22.5	21	43	43	45	90	90
7.5, ±27.5	12	24	24	19	38	38
12.5, ±2.5	43	86	86	59	119	119
12.5, ±7.5	38	76	76	57	114	114
12.5, ±12.5	33	67	67	52	105	105
12.5, ±17.5	24	48	48	40	81	81
12.5, ±22.5	14	29	29	26	52	52
12.5, ±27.5	10	19	19	19	38	38
17.5, ±2.5	19	38	38	26	52	52
17.5, ±7.5	17	33	33	26	52	52
17.5, ±12.5	12	24	24	26	52	52
17.5, ±17.5	10	19	19	26	52	52
17.5, ±22.5	7	14	14	24	48	48
17.5, ±27.5	5	10	10	19	38	38

Minimum Luminance for Arrows,and Lane Control (FL)

	Red	Yellow	Green
Arrow Indication	1,605	3,210	3,210
Lane Control Indication (Arrow)	--	--	1,605

LED signal module must meet or exceed the following illumination values for 48 months when operating over a temperature range of -40 °C to + 74 °C. Yellow LED signal module must meet or exceed the following illumination values for 48 months, when operating at 25 °C:

Minimum Maintained Intensities for Circular Indications (cd)

Angle (v,h)	8-inch			12-inch		
	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	133	267	267	339	678	678
2.5, ±7.5	97	194	194	251	501	501
2.5, ±12.5	57	113	113	141	283	283
2.5, ±17.5	25	48	48	77	154	154
7.5, ±2.5	101	202	202	226	452	452
7.5, ±7.5	89	178	178	202	404	404
7.5, ±12.5	65	129	129	145	291	291
7.5, ±17.5	41	81	81	89	178	178
7.5, ±22.5	18	37	37	38	77	77
7.5, ±27.5	10	20	20	16	32	32
12.5, ±2.5	37	73	73	50	101	101
12.5, ±7.5	32	65	65	48	97	97
12.5, ±12.5	28	57	57	44	89	89
12.5, ±17.5	20	41	41	34	69	69
12.5, ±22.5	12	25	25	22	44	44
12.5, ±27.5	9	16	16	16	32	32
17.5, ±2.5	16	32	32	22	44	44
17.5, ±7.5	14	28	28	22	44	44
17.5, ±12.5	10	20	20	22	44	44
17.5, ±17.5	9	16	16	22	44	44
17.5, ±22.5	6	12	12	20	41	41
17.5, ±27.5	4	9	9	16	32	32

Minimum Maintained Luminance for Arrow and Lane Control, (FL)

	Red	Yellow	Green
Arrow Indication	1,610	3,210	3,210
Lane Control Indication (X)	1,610	--	--
Lane Control Indication (Arrow)	--	--	1,610

LED signal module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

Red	Y: not greater than 0.308, or less than 0.998 -x
Yellow	Y: not less than 0.411, nor less than 0.995 - x, nor greater than 0.452
Green	Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

LED signal module must operate:

1. At a frequency of 60 Hz ± 3 Hz, over a voltage range from 95 V(ac) to 135 V(ac), without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used controller assemblies, including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 mA alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." Electrical connection for each Type 1 LED signal module must be 2 secured, color-coded, 3-foot long, 600 V(ac), 20 AWG minimum stranded jacketed

copper wires. Wires must comply with NEC, rated for service at +105 °C. Three wires must be used for lane control LED signal module.

LED signal module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, Subpart B, Section 15 regulations for Class A emission limits for electronic noise.

LED signal module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal module must not exceed 20 percent at an operating temperature of 25 °C.

When power is applied to LED signal module, light emission must occur within 90 ms.

Red and Yellow Flashing LED Signal Module

No external circuitry to flash the LED signal module is allowed. Use 12 V(dc) or 120 V(ac).

Flashing LED signal module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less for alternating current or 5 V(dc) for 12 V(dc) flasher units, is applied to the unit.

Electrical connection for each flashing LED signal module must be 4 secured, color-coded, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wire must comply with NEC, rated for service at +105 °C. Conductors for flashing LED signal module must be 3 feet in length, with quick disconnect terminals attached. The color code is as follows:

Color Code Requirements

Function	Color
Neutral/DC common	white
Steady On	red
Flash On	brown
Flash Out	orange

Flashing LED signal module must include all necessary electronics to:

1. Operate in a "Steady On" mode
2. Perform, in "Flash On" mode, 50 to 60 flashes per minute with a 50 percent ± 5 duty cycle
3. Allow alternating flashing operation, wig-wag, if the "Steady On" input of another flashing LED signal module is connected

When power is applied to the "Flash On" control conductor, the control output must allow a 12 V(dc) or 120 V(ac) signal that is switched opposite of the flash state of the module. Output must be able to source a maximum of 2.5 A for 12 V(dc), or 0.3 A for 120 V(ac).

Do not use the power consumption from "Flash Out" output of the flashing LED signal module when determining maximum power consumption.

The flashing LED Signal module must be clearly marked on the back, as "DC FLASHER" or "AC FLASHER," in 0.50-inch letters.

12-16.22 HIGH MAST LIGHTING ASSEMBLY

The high mast lighting assembly shall include the foundation, pole, luminaire lowering device system, luminaires and a control pedestal, as shown on the plans and in conformance with these special provisions. Poles, luminaire lowering devices and luminaires shall be furnished from the same manufacturer.

GENERAL

Installation of the lowering device on each pole shall be made under the supervision of a trained representative of the lowering device manufacturer. Prior to acceptance of the contract, a trained representative of the lowering device manufacturer shall demonstrate that each high mast lighting assembly operates properly. The demonstration shall consist of a minimum of 3 complete cycles of raising and lowering the luminaire ring (complete with luminaires) the full length of the ring's travel, as designed, within one working day, prior to acceptance of the project.

All portions of the high mast lighting assembly shall have a minimum design wind velocity rating of 80 mph.

The lowering device system shall be submitted for inspection and testing. Inspection and testing shall be performed at a site in California approved by the Engineer. The lowering device system shall be demonstrated at the Contractor's expense. Notification shall be given to the Engineer at least 7 days prior to demonstration.

After the high mast lighting system is in operation, an instructional video tape (VHS) or instructional DVD, complete written instructions and a demonstration to State Maintenance personnel on the maintenance of the high mast lighting assembly, including leveling of the luminaire ring and the procedures for the safe raising and lowering of the luminaire ring, shall be provided.

Spare parts, part lists and the operating, maintenance and service instructions, packaged with or accompanying the equipment installed on the project, shall be delivered to the Engineer prior to acceptance of the project.

SUBMITTALS

Submittals for the high mast lighting assembly shall conform to the provisions in Section 86-1.04, "Equipment List and Drawings," of the Standard Specifications and these special provisions. Submittals shall be delivered to the Engineer at least 45 days prior to erection of the high mast lighting assembly. The Engineer shall be allowed 45 days for the review of submittals. Review areas will include structural, welding, electrical and other areas as determined by the Engineer.

A. Descriptive data, design working drawings, erection working drawings (including aiming directions for each luminaire if the luminaire has an asymmetrical light distribution), isofootcandle diagram for each type of luminaire, calculations, and a list of the material used for the high mast lighting assembly shall be submitted to the Engineer. The material list shall be complete with the name of manufacturer, catalog number, size, capacity, finish, pertinent ratings and identification symbols used on the plans or in the special provisions for each unit.
B. Each submittal shall consist of 5 copies.
C. Plans and detailed drawings shall be not larger than 22" x 34".
D. Each separate item submitted shall bear a descriptive title and the State contract number.

Five copies of the submittals shall be forwarded to the Office of Structure Design. The Engineer shall be given a copy of the cover letter or other notification, and date, that the copies were sent to the Office of Structure Design.

INSPECTION

The high mast light poles will be inspected at the fabrication site. The Engineer shall be notified when materials have been delivered to the fabrication site. After delivery, the Engineer shall be given at least 10 days notice before fabrication of the light poles commences.

If all or a portion of the high mast poles are fabricated more than 300 air line miles from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing said High Mast Light Poles will be reduced by $2,500 for each fabrication site located more than 300 air line miles from both Sacramento and Los Angeles and an additional $2,500 ($5,000 total) for each fabrication site located more than 3,000 air line miles from both Sacramento and Los Angeles.

CONTROL PEDESTAL

A control pedestal shall be installed in conjunction with each high mast lighting pole as shown on the plans. Unless otherwise indicated, the control pedestal shall include the following control equipment:

A. Applicable circuit breakers (ratings as indicated on the plans) for:

   1. Main breaker
   2. Branch circuits (lighting)
   3. Motor and control
   4. Receptacle
   5. Photoelectric control
   6. Control Transformer primary and secondary protection

B. Photoelectric control (Type V as specified for Service Equipment Enclosure, unless otherwise indicated).
C. Duplex receptacle (120 V (ac), GFCI protected).
D. Control transformer primary fuse, 600 V, 2-pole with two time delay, 6-ampere fuses.
E. Control transformer with rating as shown on the plans.
F. Time clock, electromechanical, 24 hour, 120 V, 20-ampere contact rating.
G. Pilot lights, 120 V, LED type.
H. Lighting contactors, 600-V, 120-V coils, 4-pole, 30-ampere contact rating.
I. Selector switch, single-pole, double throw, 120-V, 10-ampere rotary action.

Construction and installation of the control pedestal and circuit breakers shall conform to the provisions for a Type III service equipment enclosure in Section 86-2.11, "Service," of the Standard Specifications and to the plans.

Electrical connections and terminations shall be behind dead front panels. Live connections shall not be exposed.

Unless otherwise shown, the pedestal shall be installed a minimum of 15 feet from the high mast lighting pole with doors opening away from the pole.

CORROSION RESISTANCE

Corrosion resistance shall be provided. Methods shall include the following:

A. Avoidance of contact between stainless steel and carbon steel, between different types of stainless steel (including welding material), and between aluminum and ferrous materials.
B. Utilizing continuous welding to eliminate crevices which retain moisture.
C. Minimizing welding of stainless steel.
D. Use of adequate sections and suitable materials to limit stress related corrosion.

POLE

The pole shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, and these special provisions.

The pole shall include shaft, access hole, access hole cover, support plate and anchor base.

The shaft shall consist of sections of a round or multisided (16 sides) tapered steel tube with a uniform taper of approximately 0.14-inch per foot. Segments of multisided poles shall be convex and shall have a minimum bend radius of 4 inches. The pole shall be hot-dip galvanized after fabrication in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications. Steel used in fabricating the pole shall be a weldable quality steel. No field welding shall be performed in the assembly of the pole.

The pole shall have a reinforced access hole to allow adequate clearance for maintaining and servicing the lowering device. Access hole reinforcement shall provide a bending strength equal to that of the pole without an opening. Other hardware inside the pole shall accommodate the lowering device.

The access door shall be hinged to the pole, open horizontally 180 degrees, and when in the open position shall not interfere with access to the interior of the pole.

Unless otherwise shown on the plans, the pole shall be installed with the access door towards the control pedestal.

The pole shall be erected plumb. The vertical axis of the erected pole shall be within 3 inches of the theoretical vertical axis when measured without the action of sunlight or wind.

The pole shall conform to the requirements of the latest edition and interim revisions of the AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." The maximum allowable wind deflection shall not exceed 14 percent of the pole height.

An embossed aluminum plate shall be attached with rivets to the outside of each pole approximately 2 inches above the access hole. The nameplate shall indicate the name of the pole manufacturer and the height of the pole.

A plastic laminated data sheet shall be secured on the inside of the access hole door. The data sheet shall include the names, addresses and telephone numbers of the manufacturers of the pole, luminaire lowering device and luminaires, and the design parameters, including wind velocity, luminaires (number, wattage, model number, weight, projected area and coefficient of drag), and the weight, projected area and coefficient of drag for the pole top lowering mechanism.

LUMINAIRE LOWERING DEVICE

The luminaire lowering device shall consist of a head frame, a luminaire ring and an internal power drive winch unit.

The maximum effective projected area of the total assembly at the top of the pole, exclusive of the luminaires, shall not exceed 5.75 square feet.

The weight of the head frame, luminaire ring and cover shall not exceed 250 pounds.

The head frame shall be hot rolled steel conforming to the requirements in ASTM Designation: A 36. The head frame shall be attached to the pole by means of a steel slipfitter and secured by a minimum of 4 stainless steel setscrews conforming to the requirements in ASTM Designation: F 880, Type 304. The head frame shall be hot-dip galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

The head frame shall be fitted with at least 6 hoisting cable sheaves, of either galvanized or stainless steel, or aluminum, with a minimum 5-inch pitch diameter. The head frame shall be fitted with electrical power cable sheaves or rollers configured to provide a minimum bending radius as specified by the power cable manufacturer.

The hoisting cable sheaves and electrical power cable sheaves or rollers shall be fitted with suitable keepers to keep the cables in their tracks during pole erection and operation. The sheaves shall be supported by stainless steel shafts and shall be fitted with oil-impregnated sintered bronze bushings or roller bearings.

At least 3 hoisting cables shall be supplied. The cables shall be 3/16 inch, minimum diameter, 7 x 19 strand, stainless steel aircraft cable, manufactured in conformance with the requirements in Military Specification MIL-8320B.

The head frame shall be provided with a cover designed for that device and securely attached with stainless steel machine screws conforming to the requirements in ASTM Designation: F 593, Type 304 and self-locking

nuts conforming to the chemical requirements of ASTM Designation: F 594, Type 304, or a stainless steel clamp band. The shape of the lowering device and cover shall be symmetrical about a vertical axis.

The head frame shall also include a minimum of 3 latches which support the luminaire ring when the lowering device is not in operation. Latching shall be accomplished by the alternate raising and lowering of the luminaire ring by the winch and hoisting assembly. When the luminaire ring is raised to the top of the pole, the ring shall automatically latch and be secure in a locked position. Automatic signaling devices shall be visible to indicate that each latch of the luminaire ring is safely locked in place.

No moving latch parts or springs shall be attached to the head frame. Moving parts of the latching mechanism shall be attached to the luminaire ring and serviceable from the ground.

The luminaire ring shall be fabricated of a 6" x 2" x 0.179" (7-gage), minimum, steel channel or a member of equal strength, with the appropriate number of 2-inch nominal steel tube or pipe mounting arms to accommodate the number of luminaires shown on the plans. The pipe shall conform to the requirements of ASTM Designation: A 53. The ring shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Roller-contact, spring loaded, centering arms shall be provided which shall center the luminaire ring while ascending and descending the full length of designed travel on the pole. The arm system shall keep the ring concentric with the pole in winds up to 30 mph. The rollers for the centering arms shall be a water resistant, non-marking material. Axle shafts for arms and rollers shall be stainless steel conforming to the requirements in ASTM Designation: A 276, Type 304. The arms system shall not allow the pole to be inadvertently wedged between the rollers and the luminaire ring. Ultimate support of the luminaire ring shall not be lost by individual or total spring failure.

Provisions shall be made for leveling the luminaire ring while in the lowered position. The luminaire support ring shall be level upon installation and again before completion of the contract.

A prewired 600-V (ac) terminal block in a NEMA Type 3R enclosure and a weatherproof power receptacle shall be mounted on the luminaire ring raceway. When the luminaire ring is lowered to ground level, the receptacle shall enable the luminaires to be energized and tested.

An electrical cable of sufficient length to power the luminaire ring, and with appropriate electrical connections, shall be provided to test the luminaires while in the lowered position. A circuit breaker of the rating shown on the plans and an outlet box shall be provided in the pole base.

Electrical cords shall be attached to a weathertight wiring chamber through weathertight cable connections. The main power cord shall support its full weight when installed. A positive connection between cord segments shall be provided across cord joints to prevent stress on the joints.

Power cable shall be Type SO, rated for 600 V (ac) with the number and size of conductors as required. Luminaire ring distribution cord shall be Type ST with insulation suitable for 105°C. Twist-lock receptacles (male and female) shall be provided and shall be rated at a minimum of 30-A, 480-V (ac).

The internal drive mechanism shall raise or lower the luminaire ring at an approximate speed of 11 feet per minute. The winch shall be furnished with 1/4 inch minimum diameter 7 x 19 strand stainless steel aircraft cable, conforming to the requirements in Military Specification MIL-8320B and of sufficient length to maintain at least 4 wraps around the drum with the luminaire ring in its fully lowered position. Winch cable shall wind uniformly.

The internal power drive winch unit shall include:

A. A heavy duty, totally enclosed, fan cooled, reversible universal type motor, rated at 372 W, minimum, for continuous duty, and provided with overcurrent protection.
B. An adjustable torque limiter with ball or roller bearings on all rotating shafts.
C. A remote control reversing switch (labeled "UP" and "DOWN") with minimum 20-foot cord.
D. Worm-gear driven winch with internal drag brake.
E. Mounting frame.

F. Weatherproof step-down transformer, if necessary, of sufficient power to supply the motor and provided with overcurrent protection. The transformer, when installed inside the pole, shall be removable without removing other components.
G. Other equipment as necessary.

Internal power drive winch unit components, including transformer, shall be removable through the access hole for repair or replacement.

LUMINAIRES

Each luminaire shall be type V distribution, B.U.G. rating of 0 (full cutoff) and shall consist of a housing, LED modules, drivers and a surge suppressor.

Housings shall be fabricated of low copper 356 cast aluminum. The housing cover shall be hinged type, and held in place with 2 captive bolts, allowing for easy access to the top of the luminaire, driver modules, surge suppressors and terminal blocks for wiring convenience. The cover shall also be finned to allow for efficient cooling of the drivers. An external aluminum environmental guard shall protect the luminaire against dirt and debris, and allow for air flow through the bottom of the luminaire, past the LED modules, and to exit out the top. Housing finish shall pass a 1000 hour salt fog test in accordance with ASRM B117 and D1654.

Each luminaire shall have 14 LED modules, providing a total of 40,515 total lumens, and consuming not more than 560 watts. The LED modules shall be chip on board technology type, and shall each be protected by a prismatic borosilicate glass lens, providing even distribution of light. Each LED module shall be mounted directly to a cold forged aluminum fin assembly allowing for efficient cooling, and maintenance free long life in excess of 100,000 hours. LEDs shall be 4000 K temperature with a minimum CRI of 65.

Drivers shall be class 1 LED type rated for 85,000 hours minimum life, have a power factor of a minimum 90%, and a total harmonic distortion (THD) of 20%.

Surge suppressors shall be class C outdoor rated 10 kV/5kA per ANSI/IEEE C62.41.

Each luminaire shall be provided with a slipfitter for mounting on a 2-inch horizontal pipe tenon and shall be adjustable to plus or minus 3 degrees from the axis of the tenon, and be rated to 3G per ANSI C136.1.

Each luminaire shall enclose a dual fuseholder and 2 fuses rated at 5 A at 480 V (ac). Each fuse shall be the standard midget ferrule type, with "Non-Time-Delay" feature, shall be ETL or UL listed, and shall be 13/32" x 1-1/2".

Each luminaires shall not exceed 80 pounds in weight and have a maximum effective projected area of 1.6 square feet.

Luminaires shall be UL 1598 listed, 77 degrees F, wet location, and be warranted for 5 years. Luminaires shall be 100% electrical tested prior to shipment.

12-16.23 SIGN LIGHTING FIXTURES-FLUORESCENT

Each fluorescent sign lighting fixture shall be designed for mounting at the bottom of the sign on an overhead sign structure as shown on the plans and shall conform to these special provisions. The fixture shall be fully enclosed, raintight, dust tight, corrosion-resistant and with a hinged plastic cover.

Painting of fixtures will not be required.

HOUSING

The shell of the fixture shall be fabricated of 0.064-inch, minimum nominal thickness, 5052-H32 aluminum alloy sheet or fabricated of another material which will provide an equivalent strength and corrosion resistance.

The maximum dimensions of the fixture housing with cover shall be 38 inches long, 15-1/2 inches wide, and 5-1/2 inches high.

External machine screw parts, lock washers, hinge pins, and other miscellaneous steel parts shall be made of Type 302 or 304 stainless steel.

REFLECTOR

The reflector shall be fabricated of 0.020-inch, minimum nominal thickness, 5052-H32 aluminum alloy sheet with Type 1175 alloy cladding on the reflective side.

The reflector surface shall be polished prior to anodizing. The finish process shall be performed before or after fabrication of the reflector and shall include an electrochemical brightening procedure using an acid process. The minimum amount of the protective oxide coating shall be 0.025-ounces per square foot. The coating shall be sealed.

The reflector shall have a specular reflectance of not less than 74 percent when measured at 45 degree specular angle in conformance with the requirements in California Test 650.

Reflectors shall be protected during forming and assembling with secure coverings which shall be removed after the assembly has been completed.

Reflectors shall have hemmed edges for safe handling.

COVER

Cover shall be of acrylic material.

Each plastic cover shall latch easily and securely in place without the use of tools and shall be completely free from any tendency to loosen under high winds and vibration. The cover shall be fitted with nonstretching safety cords, chain safety devices, or equivalent, which shall also serve as stops when the cover is hinged open.

GASKETS

Gaskets between the cover and the fixture housing shall be uniform and even-textured, shall be either square-section polyvinyl chloride formed tube or closed cell neoprene foam, and shall have a pressure sensitive adhesive on one side.

Gaskets shall be neatly applied to thoroughly degreased, clean surfaces with a suitable heat resistant adhesive which will not allow the gasket to slip at a temperature of 71°C (continuous).

LAMPHOLDERS

Lampholders shall be listed by the UL or ETL for outdoor use and shall be provided with silver coated contacts and waterproofed lead entrance. The lampholder for each lamp shall be the spring-loaded type. Each lampholder shall be provided with a heat-resistant, circular cross section, partially recessed neoprene ring to seal against the lamp ends and protect electrical contacts from moisture and dirt or other injurious elements.

The distance between the face of the lampholders for each lamp shall provide a compression of at least 0.10-inch on the spring-type lampholder when the lamp is in place. The lamp shall have positive mechanical and electrical contact when the lamp is in place. The socket on the spring-type lampholder shall have sufficient travel to permit installation of the lamp.

Springs for lampholders shall not be a part of the current carrying circuit.

Lampholders shall match lamp requirements and shall not increase cathode filament circuit resistance by more than 0.01-Ω.

TERMINAL BLOCKS

Terminal block for integral ballast fixtures shall be the heavy-duty pressure connector type with a minimum rating of 35 A, 600 V (ac), and shall have a phenolic base, marking strip and corrosion resistant metal parts. Terminal screws shall not be smaller than size No. 10. Marking strips shall have permanent symbols indicating wire color as shown on the plans. A label shall be placed adjacent to the terminal block to indicate input voltage.

Lamp circuit connections in the fixtures and in the ballast boxes shall terminate on molded, phenolic, barrier type terminal blocks rated at 15 A, 600 V (ac), and shall have integral type, white waterproof marking strips. Current carrying parts of the terminal blocks shall be insulated from the fixture or ballast box with integral plugs or strips to provide an insulating value in excess of the line-to-ground flashover voltage. If the Contractor elects to use sectionalized terminal blocks, each section shall be provided with an integral barrier on each side and shall be capable of rigid mounting and alignment.

CONDUCTORS

Conductors within the fixture shall be UL or ETL listed appliance wiring material (AWM), stranded copper wire with 30 mils thermoplastic insulation. Conductors for ballasts shall be No. 16. Ballast conductors shall be secured with easily removable spring cross straps (not clamped, cabled or served) on the underside of the chassis.

Conductors between sign switch and fixture terminal blocks shall be No. 14, minimum.

Stranded copper conductors shall be tinned before insertion into pressure connector type terminals. Conductors connected to screw type terminals shall terminate in crimp type ring connectors.

LAMPS

Each fixture shall be provided with one F36T12CW/HO, cool white, rapid-start fluorescent lamp which shall meet the requirements in ANSI Standard: C 78.

The lamps shall operate from 2-lamp or 3-lamp ballasts, wherever possible.

FUSES

Fuses shall be the miniature, slow blowing type with appropriate current and voltage rating.

Fuseholder shall be a panel mounting type with threaded or bayonet knob which grips fuse tightly for extraction.

BALLASTS

Ballasts shall be of the high power factor type and shall start the lamps at -20°C and above.

Ballasts shall be rated at 800 mA for high output type rapid-start lamps. Ballasts shall be listed by the UL or ETL for outdoor operation on 277 V , 60 Hz circuits and shall conform to the requirements of ANSI Standard: C 82.1 and ANSI Standard: C 82.2.

AMENDMENTS TO THE STANDARD SPECIFICATIONS

DATED MAY 2006

(Issued 01-20-12)

Global revisions are changes to contract documents not specific to a section of the Standard Specifications. In each contract document at each occurrence, interpret the following terms as shown:

Term	Interpretation	Conditions
AC	HMA	1. Where AC means asphalt concrete 2. Except where existing AC is described
Asphalt concrete	Hot mix asphalt	Except where existing asphalt concrete is described
Class 1 concrete	Concrete containing not less than 675 pounds of cementitious material per cubic yard	--
Class 2 concrete	Concrete containing not less than 590 pounds of cementitious material per cubic yard	--
Class 3 concrete	Concrete containing not less than 505 pounds of cementitious material per cubic yard	--
Class 4 concrete	Concrete containing not less than 420 pounds of cementitious material per cubic yard	--
Clause providing an option to use either a class concrete or minor concrete	Use minor concrete	--
Clause referring to a delay as a right-of-way delay	Delay under Section 8-1.09, "Delays"	--
Contact joint	Construction joint	--
Controlling operation	Controlling activity	--
Engineer's Estimate	Verified Bid Item List	--
Engineering fabrics	Geosynthetics	--
Notice to Contractors	Notice to Bidders	--
Partial payments	Progress payments	Except in Section 9-1.07D, "Mobilization"
PCC pavement	Concrete pavement	Except where existing PCC pavement is described
Portland cement concrete pavement	Concrete pavement	Except where existing portland cement concrete pavement is described
Project information	Supplemental project information	Except in "Contract Project Information Signs"
Reference to a working day or non–working day under Section 8-1.06, "Time of Completion"	Working day as defined in Section 1-4.02, "Glossary"	--
Section 9-1.015	Section 9-1.01C	--
Section 86, "Signal, Lighting and Electrical Systems"	Section 86, "Electrical Systems"	--
Section 86-2.08, "Conductors"	Section 86-2.08, "Conductors and Cables"	--
Section 86-5.01A(5), "Installation Details"	Section 86-5.01A(4), "Installation Details"	--
Section 86-6.05, "Sign Lighting Fixtures—Mercury"	Section 86-6.05, "Induction Sign Lighting Fixtures"	--
Time extension due to an unanticipated event not caused by either party or an issue involving	Non–working day	--

a third party under Section 8-1.07, "Liquidated Damages"		
Time extension due to an act of the Engineer or of the Department not contemplated by the contract	Time adjustment under Section 8-1.09B, "Time Adjustments"	--
Weakened plane joint	Contraction joint	--

^^

SECTION 1 DEFINITIONS AND TERMS
(Issued 06-20-12)

Replace Section 1 with:

SECTION 1 GENERAL

1-1 GENERAL

1-1.01 GENERAL

Section 1 includes general rules of interpretation.

The Department is gradually standardizing the style and language of the specifications. The new style and language includes:

1. Use of:

    1.1. Imperative mood
    1.2. Introductory modifiers
    1.3. Conditional clauses

2. Elimination of:

    2.1. Language variations
    2.2. Definitions for industry-standard terms
    2.3. Redundant specifications
    2.4. Needless cross-references

The use of this new style does not change the meaning of a specification not yet using this style.

Sections 1 through 9 include general specifications applicable to every contract unless specified as applicable under certain conditions.

Sections 10 through 15 include specifications for general construction applicable to every contract unless specified as applicable under certain conditions.

The specifications are written to the Bidder before award and the Contractor after. Before award, interpret sentences written in the imperative mood as starting with "The Bidder must" and interpret "you" as "the Bidder" and "your" as "the Bidder's." After award, interpret sentences written in the imperative mood as starting with "The Contractor must" and interpret "you" as "the Contractor" and "your" as "the Contractor's."

Omission of "a," "an," and "the" is intentional. These articles have been omitted in some specifications for streamlining purposes.

Unless an object or activity is specified to be less than the total, the quantity or amount is all of the object or activity.

A plural term includes the singular.

All items in a list apply unless the items are specified as choices.

Headings are included for the purposes of organization and referencing. Inclusion of a heading with no related content, "Reserved," or "Not Used" does not indicate that no specification exists for that subject; applicable specifications may be covered in a general or referenced specification.

1-2 REFERENCES

1-2.01 REFERENCES

Where Standard Specifications refer to the special provisions to describe the work, interpret the reference as a reference to the Bid Item List, the special provisions, or both.

Interpret a reference to a section of the Standard Specifications as a reference to the Standard Specifications as revised by any amendment, special provision, or both.

A reference within parentheses to a law or regulation is included in the contract for convenience only and is not a comprehensive listing of related laws and regulations. Lack of a reference does not indicate no related laws or regulations exist.

Where the version of a referenced document is not specified, use the current version in effect on the date of Notice to Bidders.

A reference to a subsection includes the section's general specifications of which the subsection is a part.

A code not specified as a Federal code is a California code.

1-3 ABBREVIATIONS AND MEASUREMENT UNITS

1-3.01 ABBREVIATIONS

Abbreviations

Abbreviation	Meaning
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMA	archaeological monitoring area
ANSI	American National Standards Institute
APHA	American Public Health Association
API	American Petroleum Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CIH	Certified Industrial Hygienist
DBE	Disadvantaged Business Enterprise
DVBE	Disabled Veteran Business Enterprise
EIA	Electronic Industries Alliance
ESA	environmentally sensitive area
ETL	Electrical Testing Laboratories
(F)	final pay item
FHWA	Federal Highway Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NEC	National Electrical Code
NETA	National Electrical Testing Association, Inc.
NEMA	National Electrical Manufacturers Association
PLAC	permit, license, agreement, certification, or any combination of these
RFI	request for information
SSPC	The Society for Protective Coatings
TIA	time impact analysis
UL	Underwriters' Laboratories Inc.

1-3.02 MEASUREMENT UNITS

Measurement Units

Symbols as used in the specifications	Symbols as used in the Bid Item List	Meaning
A	—	amperes
	ACRE	acre
	CF	cubic foot
	CY	cubic yard
--	EA	each
g	--	gram
ksi	--	kips per square inch
	GAL	gallon
h	H	hour
	LB	pound
--	LS	lump sum
	LF	linear foot
	LNMI	lane mile
	MFBM	thousand foot board measure
	MI	mile
	MSYD	thousand station yard
Ω	--	ohm
pcf	--	pounds per cubic foot
s	--	second
	STA	100 feet
	SQFT	square foot
	SQYD	square yard
	TAB	tablet
ton	TON	2,000 pounds
V	--	volt
W	--	watt
--	WDAY	working day

1-4 DEFINITIONS

1-4.01 GENERAL

Interpret terms as defined in the contract documents. A construction-industry term not defined in the contract documents has the meaning defined in Means Illustrated Construction Dictionary, Condensed Version, Second Edition.

1-4.02 GLOSSARY

aerially deposited lead: Lead primarily from vehicle emissions deposited within unpaved areas or formerly unpaved areas.

archaeological monitoring area: Area within, near, or straddling the project limits where access is allowed, but work is subject to archaeological monitoring.

archaeological resources: Remains of past human activity, including historic and prehistoric material (e.g., tools and tool fragments, hearth and food remains, structural remains, and human remains).

acceptance: Formal written acceptance by the Director of an entire contract that has been completed in all respects in accordance with the plans and specifications and any modifications to them previously approved.

base: Layer of specified material of planned thickness placed immediately below the pavement or surfacing.

basement material: Material in excavation or embankments underlying the lowest layer of subbase, base, pavement, surfacing, or other specified layer to be placed.

bid item: Specific work unit for which the bidder provides a price.

Bid Item List: List of bid items and the associated quantities.

Bid Item List, verified: Bid Item List with verified prices. The Contract Proposal of Low Bidder at the Department's Web site is the verified Bid Item List.

bridge: Structure, with a bridge number, that carries a utility facility, or railroad, highway, pedestrian or other traffic, over a water course or over or under or around any obstruction.

building-construction contract: Contract that has "building construction" on the cover of the Notice to Bidders and Special Provisions.

business day: Day on the calendar except Saturday or holiday.

California Manual on Uniform Traffic Control Devices: The California Manual on Uniform Traffic Control Devices for Streets and Highways (California MUTCD) is issued by the Department of Transportation and is the Federal Highway Administration's MUTCD 2003 Edition, as amended for use in California.

Certified Industrial Hygienist: Industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.

conduit: Pipe or tube in which smaller pipes, tubes, or electrical conductors are inserted or are to be inserted.

contract: Written and executed contract between the Department and the Contractor.

contract bonds: Security for the payment of workers and suppliers furnishing materials, labor, and services and for guaranteeing the Contractor's work performance.

contract item: Bid item.

Contractor: Person or business or its legal representative entering into a contract with the Department for performance of the work.

culvert: Structure, other than a bridge, that provides an opening under a roadway for drainage or other purposes.

day: 24 consecutive hours running from midnight to midnight; calendar day.

deduction: Amount of money permanently taken from progress payment and final payment. Deductions are not retentions under Pub Cont Code § 7107.

Department: Department of Transportation as defined in St & Hwy Code § 20 and authorized in St & Hwy Code § 90; its authorized representatives.

detour: Temporary route for traffic around a closed road part. A passageway through a job site is not a detour.

Director: Department's Director.

Disabled Veteran Business Enterprise: Business certified as a DVBE by the Office of Small Business and DVBE Services, Department of General Services.

Disadvantaged Business Enterprise: Disadvantaged Business Enterprise as defined in 49 CFR 26.5.

divided highway: Highway with separated traveled ways for traffic, generally in opposite directions.

Engineer: Department's Chief Engineer acting either directly or through properly authorized agents; the agents acting within the scope of the particular duties delegated to them.

environmentally sensitive area: Area within, near, or straddling the project limits where access is prohibited or limited to protect environmental resources.

Federal-aid contract: Contract that has a Federal-aid project number on the cover of the Notice to Bidders and Special Provisions.

fixed costs: Labor, material, or equipment cost directly incurred by the Contractor as a result of performing or supplying a particular bid item that remains constant regardless of the item's quantity.

frontage road: Local street or road auxiliary to and located generally on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

grading plane: Basement material surface on which the lowest layer of subbase, base, pavement, surfacing, or other specified layer is placed.

highway: Whole right of way or area that is reserved for and secured for use in constructing the roadway and its appurtenances.

holiday:

1. Every Sunday
2. January 1st, New Year's Day
3. 3rd Monday in January, Birthday of Martin Luther King, Jr.
4. February 12th, Lincoln's Birthday
5. 3rd Monday in February, Washington's Birthday
6. March 31st, Cesar Chavez Day
7. Last Monday in May, Memorial Day
8. July 4th, Independence Day
9. 1st Monday in September, Labor Day
10. 2nd Monday in October, Columbus Day
11. November 11th, Veterans Day
12. 4th Thursday in November, Thanksgiving Day
13. Day after Thanksgiving Day
14. December 25th, Christmas Day

If January 1st, February 12th, March 31st, July 4th, November 11th, or December 25th falls on a Sunday, the Monday following is a holiday. If November 11th falls on a Saturday, the preceding Friday is a holiday. Interpret "legal holiday" as "holiday."

idle equipment: Equipment:

1. On the job site at the start of a delay
2. Idled because of the delay
3. Not operated during the delay

informal-bid contract: Contract that has "Informal Bid Authorized by Pub Cont Code §10122" on the cover of the Notice to Bidders and Special Provisions.

Information Handout: Supplemental project information furnished to bidders as a handout.

laboratory: Laboratory authorized by the Department to test materials.

liquidated damages: Amount prescribed in the specifications, pursuant to the authority of Pub Cont Code § 10226, to be paid to the State or to be deducted for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

listed species: Any species listed as threatened or endangered under (1) Federal Endangered Species Act of 1973, 16 USC §1531 et seq., (2) California Endangered Species Act, Fish & Game Code §§ 2050–2115.5, (3) or both.

material shortage: Shortage of raw or produced material that is area-wide and caused by an unusual market condition, except if any of the following occurs:

1. Shortage relates to a produced, nonstandard material
2. Supplier's and the Contractor's priority for filling an order differs
3. Event outside the U.S. for a material produced outside the U.S.

median: Portion of a divided highway separating the traveled ways for traffic in opposite directions including inside shoulders.

mobilization: Preparatory work that must be performed or costs incurred before starting work on the various items on the job site (Pub Cont Code § 10104).

Notice to Bidders: Document that provides a general work description, bidder and bid specifications, and the time and location the Department receives bids.

paleontological resources: Fossils and the deposits they are found in. Fossils are evidence of ancient life preserved in sediments and rock. Examples of paleontological resources are remains of (1) animals, (2) animal tracks, (3) plants, and (4) other organisms. Archaeological resources are not paleontological and fossils found within an archaeological resource are generally considered archaeological resources, not paleontological resources.

pavement: Uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with surfacing.

permitted biological activities: Monitoring, surveying, or other practices that require a take permit and project specific permission from U.S. Fish and Wildlife Service or NOAA Fisheries or a take permit or Memorandum of Understanding with Department of Fish and Game.

plans: Official project plans and Standard Plans, profiles, typical cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. These documents are to be considered as a part of the plans.

In the above definition, the following terms are defined as follows:

Standard Plans: Standard Plans issued by the Department.

project plans: Specific details and dimensions peculiar to the work supplemented by the Standard Plans insofar as the same may apply.

protective radius: Minimum distance between construction activities and regulated species.

regulated species: Any species protected by one or any combination of the following:

1. Federal Endangered Species Act of 1973, 16 USC §1531 et seq.
2. California Endangered Species Act, Fish & Game Code §§2050–2115.5
3. Fish & Game Code §§1600–1616
4. National Environmental Policy Act, 42 USC §4321 et seq.
5. California Environmental Quality Act, Pub Res Code § 21000 et.seq.
6. Other law or regulation that governs activities that affect species or their habitats.

roadbed: Area between the intersection of the upper surface of the roadway and the side slopes or curb lines. The roadbed rises in elevation as each increment or layer of subbase, base, surfacing or pavement is placed. Where the medians are so wide as to include areas of undisturbed land, a divided highway is considered as including 2 separate roadbeds.

roadway: Highway portion included between the outside lines of sidewalks, or curbs, slopes, ditches, channels, waterways, and including all the appertaining structures, and other features necessary to proper drainage and protection.

routine biological activities: Biological monitoring, surveying, or other activity that does not require a take permit from the U.S. Fish and Wildlife Service or NOAA Fisheries or a take permit or Memorandum of Understanding with Department of Fish and Game.

service-approved biologist: Biologist whose activities must be approved by a state or federal agency as provided in PLACs.

shoulder: Roadway portion contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

small tool: Tool or piece of equipment not listed in Labor Surcharge and Equipment Rental Rates that has a replacement value of $500 or less.

special provisions: Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to these Standard Specifications. The Department's publication titled "Labor Surcharge And Equipment Rental Rates" is part of the special provisions.

specifications: Directions, provisions, and requirements contained in these Standard Specifications, Amendments to the Standard Specifications, and the special provisions. Where the term "these specifications" or "these Standard Specifications" is used in this book, it means the provisions set forth in this book.

State: State of California, including its agencies, departments, or divisions, whose conduct or action is related to the work.

Structure Design: Offices of Structure Design of the Department.

subbase: Layer of specified material of planned thickness between a base and the basement material.

subgrade: Roadbed portion on which pavement, surfacing, base, subbase, or a layer of any other material is placed.

substructure: Bridge portions below the bridge seats, tops of piers, haunches of rigid frames, or below the spring lines of arches. Backwalls and parapets of abutments and wingwalls of bridges are portions of the substructure.

superstructure: Bridge portion except the bridge substructure.

supplemental project information: Information relevant to the project, specified as supplemental project information, and made available to bidders.

surfacing: Uppermost layer of material placed on the traveled way, or shoulders. This term is used interchangeably with pavement.

take: Legal definition regarding harm to listed species as defined in 16 USC §1532 and Fish & Game Code § 86.

take permit: Permit granted by the US Fish and Wildlife Service or by the NOAA Fisheries that allows take of federal listed species under 16 USC §1539 or by the Department of Fish & Game that allows take of state listed species under to Fish & Game Code § 2081.

traffic lane: Portion of a traveled way for the movement of a single line of vehicles.

traveled way: Portion of the roadway for the movement of vehicles, exclusive of shoulders.

total bid: Sum of the item totals as verified by the Department; original contract price.

withhold: Money temporarily or permanently taken from progress payment. Withholds are not retentions under Pub Cont Code § 7107.

work: All the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments, or extensions to it made by contract change order or other written orders of the Engineer.

working day: Time measure unit for work progress. A working day is any day except:

1. Saturdays and holidays
2. A day when you cannot perform work on the controlling activity for at least 50 percent of the day with at least 50 percent of the normal labor and equipment due to any of the following:

    2.1. Adverse weather-related conditions that cause you to dismiss the crew
    2.2. Maintaining traffic under the contract

2.3. The Engineer's direction to suspend the controlling activities for reasons unrelated to your performance

2.4. An unanticipated event not caused by either party such as:

- 2.4.1. Act of God (Pub Cont Code § 7105)
- 2.4.2. Act of a public enemy
- 2.4.3. Epidemic
- 2.4.4. Fire
- 2.4.5. Flood
- 2.4.6. Governor-declared state of emergency
- 2.4.7. Landslide
- 2.4.8. Quarantine restriction

2.5. An issue involving a third-party, including:

- 2.5.1. Industry or area-wide labor strike
- 2.5.2. Material shortage
- 2.5.3. Freight embargo
- 2.5.4. Jurisdictional requirement of a law enforcement agency
- 2.5.5. Workforce labor dispute of a utility or non-highway facility owner resulting in a utility or non-highway facility reconstruction not described and not solely for the Contractor's convenience

1-5 DISTRICTS

District Composition and Office Addresses

District	Counties	Location Address	Mailing Address
1	Del Norte (DN), Humboldt (Hum), Lake (Lak), Mendocino (Men)	1656 UNION ST EUREKA, CA	PO BOX 3700 EUREKA CA 95502
2	Lassen (Las), Modoc (Mod), Plumas (Plu), Shasta (Sha), Siskiyou (Sis), Tehama (Teh), Trinity (Tri)	1657 RIVERSIDE DR REDDING, CA	PO BOX 496073 REDDING CA 96049-6073
3	Butte (But), Colusa (Col), El Dorado (ED), Glenn (Gle), Nevada (Nev), Placer (Pla), Sacramento (Sac), Sierra (Sie), Sutter (Sut), Yolo (Yol), Yuba (Yub)	703 B ST MARYSVILLE, CA	703 B ST MARYSVILLE CA 95901
4	Alameda (Ala), Contra Costa (CC), Marin (Mrn), Napa (Nap), San Francisco (SF), San Mateo (SM), Santa Clara (SCl), Solano (Sol), Sonoma (Son)	111 GRAND AVE OAKLAND, CA	PO BOX 23660 OAKLAND CA 94623-0660
5	Monterey (Mon), San Benito (SBt), San Luis Obispo (SLO), Santa Barbara (SB), Santa Cruz (SCr)	50 HIGUERA ST SAN LUIS OBISPO, CA	50 HIGUERA ST SAN LUIS OBISPO CA 93401-5415
6	Fresno (Fre), Kern (Ker), Kings (Kin), Madera (Mad), Tulare (Tul)	1352 W. OLIVE AVE FRESNO, CA	PO BOX 12616 FRESNO CA 93728-2616
7	Los Angeles (LA), Ventura (Ven)	100 S. MAIN ST LOS ANGELES	100 S MAIN ST LOS ANGELES CA 90012
8	Riverside (Riv), San Bernardino (SBd)	464 W 4TH ST SAN BERNARDINO, CA	464 W 4TH ST SAN BERNARDINO CA 92401-1400
9	Inyo (Iny), Mono (Mno)	500 S MAIN ST BISHOP, CA	500 S MAIN ST BISHOP CA 93514-3423
10	Alpine (Alp), Amador (Ama), Calaveras (Cal), Mariposa (Mpa), Merced (Mer), San Joaquin (SJ), Stanislaus (Sta), Tuolumne (Tuo)	1976 E CHARTER WAY STOCKTON, CA	PO BOX 2048 STOCKTON CA 95201
11	Imperial (Imp), San Diego (SD)	4050 TAYLOR ST SAN DIEGO, CA	4050 TAYLOR ST SAN DIEGO CA 92110-2737
12	Orange (Ora)	3347 MICHELSON DR STE 100 IRVINE, CA	3347 MICHELSON DR STE 100 IRVINE CA 92612-0661

A project with work in District 1, 2, or 3 is a North Region project. For Districts 1, 2, and 3, interpret each reference to the district office as the North Region office. The North Region office address is the District 3 address.

1-6 WEB SITES, ADDRESSES, AND TELEPHONE NUMBERS

Web Sites, Addresses, and Telephone Numbers

Agency, Department Unit, or Reference	Web Site	Address	Telephone No.
Bidders' Exchange	www.dot.ca.gov/hq/esc/oe/bidex	MSC 26 BIDDERS' EXCHANGE DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005	(916) 227-6259
Department	www.dot.ca.gov		
Department of General Services, Office of Small Business and DVBE Services	www.pd.dgs.ca.gov/smbus/default.htm	OFFICE OF SMALL BUSINESS AND DVBE SERVICES DEPARTMENT OF GENERAL SERVICES 707 3RD ST WEST SACRAMENTO CA 95605-2811	(800) 559-5529 (916) 375-4940
Department of Industrial Relations	www.dir.ca.gov		
Department of Industrial Relations, Division of Apprenticeship Standards		455 GOLDEN GATE AVENUE SAN FRANCISCO, CA 94102	
Division of Accounting, Office of External Accounts Payable	http://www.dot.ca.gov/hq/asc/oap/payments/contact.htm#conpets1	MAJOR CONSTRUCTION PAYMENT AND INFORMATION UNIT OFFICE OF EXTERNAL ACCOUNTS PAYABLE DIVISION OF ACCOUNTING DEPARTMENT OF TRANSPORTATION P.O. BOX 168043 SACRAMENTO, CA 95816-8043	(916) 227-9013
Office Engineer		MSC 43 OFFICE ENGINEER DEPARTMENT OF TRANSPORTATION 1727 30TH ST SACRAMENTO CA 95816-7005	
Office Engineer–All Projects Currently Advertised	http://www.dot.ca.gov/hq/esc/oe/weekly_ads/all_advertised.php		
Offices of Structure Design, Documents Unit		MSC 9-4/4I DOCUMENTS UNIT OFFICES OF STRUCTURE DESIGN DEPARTMENT OF TRANSPORTATION 1801 30TH ST SACRAMENTO CA 95816-7006	(916) 227-0716
Publication Distribution Unit		PUBLICATION UNIT DEPARTMENT OF TRANSPORTATION 1900 ROYAL OAKS DRIVE SACRAMENTO CA 95815-3800	

Transportation Laboratory		MATERIALS AND ENGINEERING TESTING SERVICES AND GEOTECHNICAL SERVICES DEPARTMENT OF TRANSPORTATION 5900 FOLSOM BLVD SACRAMENTO CA 95819-4612	(916) 227-7000
Department's Pre-Qualified Products List	http://www.dot.ca.gov/hq/esc/approved_products_list		

^^

SECTION 2 PROPOSAL REQUIREMENTS AND CONDITIONS
(Issued 01-20-12)

Replace Section 2 with:
SECTION 2 BIDDING

2-1.01 GENERAL

Section 2, "Bidding," includes specifications related to bid eligibility and the bidding process.

2-1.02 BID INELIGIBILITY

A firm that has provided architectural or engineering services to the Department for this contract before bid submittal for this contract is prohibited from any of the following:

1. Submit a bid
2. Subcontract for a part of the work
3. Supply materials

2-1.03 BID DOCUMENTS

2-1.03A General

Standard Specifications and Standard Plans may be viewed at the Department's Web site and may be purchased at the Publication Distribution Unit.

Special provisions, Amendments to the Standard Specifications, and project plans may be viewed at the Bidders' Exchange. To obtain bid books, submit a request to the Bidders' Exchange. For an informal-bid contract, you may also obtain special provisions, Amendments to the Standard Specifications, and project plans at the Bidders' Exchange.

2-1.03B Supplemental Project Information

Logs of test borings attached to the project plans are supplemental project information. The Department makes other supplemental information available as specified in the special provisions.

If an Information Handout or cross sections are available:

1. You may view them at the Office Engineer–All Projects Currently Advertised Web site
2. For an informal-bid contract, you may obtain them at the Bidders' Exchange street address

If rock cores are available for inspection, you may view them by sending a request to Coreroom@dot.ca.gov.

If other supplemental project information is available for inspection, you may view it by phoning in a request.

Make your request at least 7 days before viewing. Include in your request:

1. District-County-Route
2. Contract number
3. Viewing date
4. Contact information, including telephone number.

For rock cores, also include the bridge number in your request.
If bridge as-built drawings are available:

1. For a project in District 1 through 6 or 10, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357
2. For a project in District 7, 8, 9, 11, or 12, you may request them from the Office of Structure Maintenance and Investigations, fax (916) 227-8357, and they are available at the Office of Structure Maintenance and Investigations, Los Angeles, CA, telephone (213) 897-0877

As-built drawings may not show existing dimensions and conditions. Where new construction dimensions are dependent on existing bridge dimensions, verify the field dimensions and adjust dimensions of the work to fit existing conditions.

2-1.04–2-1.10 RESERVED

2-1.11 JOB SITE AND DOCUMENT EXAMINATION

Examine the job site and bid documents.

Bid submission is your acknowledgment that you have examined the job site and bid documents and are satisfied with:

1. General and local conditions to be encountered
2. Character, quality, and scope of work to be performed
3. Quantities of materials to be furnished
4. Character, quality, and quantity of surface and subsurface materials or obstacles
5. Requirements of the contract

2-1.12 BID DOCUMENT COMPLETION

2-1.12A General

Complete forms in the Bid book.

Except for the bid item number and the percentage of each item subcontracted, do not fax submittals.

2-1.12B Bid Item List and Bid Comparison

Submit a bid based on the work item quantities the Department shows in the Bid Item List.

For a lump sum based bid, the Department compares bids based on the total price.

For a unit price based bid, the Department compares bids based on the sum of the item totals.

For a cost plus time based bid, the Department compares bids based on the sum of the item totals and the total bid for time. If your bid for time exceeds the number of working days described in the Notice to Bidders, your bid is nonresponsive.

2-1.12C Subcontractor List

In the Subcontractor List, list each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid or $10,000, whichever is greater (Pub Cont Code § 4100 et seq.)

The Subcontractor List must show the name, address, and work portions to be performed by each subcontractor listed. Show work portion by bid item number, description, and percentage of each bid item subcontracted.

On the Subcontractor List you may either submit each subcontracted bid item number and corresponding percentage with your bid or fax these numbers and percentages to (916) 227-6282 within 24 hours after bid opening. Failure to do so results in a nonresponsive bid.

2-1.13 BIDDER'S SECURITY

Submit your bid with one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cash
2. Cashier's check
3. Certified check
4. Bidder's bond signed by a surety insurer who is licensed in California

Make checks and bonds payable to the Department of Transportation.

If using a bidder's bond, you may use the form in the Bid book. If you do not use the form in the Bid book, use a form containing the same information.

2-1.14 BID SUBMITTAL

Submit your bid:

1. Under sealed cover
2. Marked as a bid
3. Identifying the contract number and the bid opening date

If an agent other than the authorized corporation officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

2-1.15 BID WITHDRAWAL

An authorized agent may withdraw a bid before the bid opening date and time by submitting a written bid withdrawal request at the location where the bid was submitted. Withdrawing a bid does not prevent you from submitting a new bid.

After the bid opening time, you cannot withdraw a bid.

2-1.16 BID OPENING

The Department publicly opens and reads bids at the time and place described in the Notice to Bidders.

2-1.17 BID REJECTION

The Department may reject:

1. All bids
2. A nonresponsive bid

2-1.18 BID RELIEF

The Department may grant bid relief under Pub Cont Code § 5100 et seq. Submit any request for bid relief to the Office Engineer. For Relief of Bid Request form, go to:

http://www.dot.ca.gov/hq/esc/oe/contractor_info/relief.pdf

2-1.19 SUBMITTAL FAILURE HISTORY

The Department considers a bidder's past failure to submit documents required after bid opening in determining a bidder's responsibility.

2-1.20 BID RIGGING

Section 2-1.20, "Bid Rigging," applies to a Federal-aid contract.

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available Monday through Friday between 11:00 a.m. and 8:00 p.m. and is confidential and anonymous. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

^^

SECTION 3 AWARD AND EXECUTION OF CONTRACT

(Issued 10-19-12)

Replace Section 3 with:

SECTION 3 CONTRACT AWARD AND EXECUTION

3-1.01 SCOPE

Section 3, "Contract Award and Execution," includes specifications related to contract award and execution.

3-1.02 CONTRACT AWARD

Submit any bid protest to the Office Engineer.

If the Department awards the contract, the award is made to the lowest responsible bidder within the number of days shown in the following table:

Contract Award Period

Days (after bid opening)	Project Estimated Cost shown in the Notice to Bidders
30	< $200 million
60	≥ $200 million

The Department may extend the specified award period if the bidder agrees.

You may request to extend the award period by faxing a request to (916) 227-6282 before 4:00 p.m. on the last day of the award period. If you do not make this request, after the specified award period:

1. Your bid becomes invalid
2. You are not eligible for the award of the contract

3-1.03 CONTRACT BONDS (PUB CONT CODE §§ 10221 AND 10222)

The successful bidder must furnish:

1. Payment bond to secure the claim payments of laborers, workers, mechanics, or materialmen providing goods, labor, or services under the contract. This bond must be equal to at least 100 percent of the total bid.
2. Performance bond to guarantee the faithful performance of the contract. This bond must be equal to at least 50 percent of the total bid.

The Department furnishes the successful bidder with the bond forms.

3-1.04 CONTRACTOR LICENSE

For a Federal-aid contract, the Bidder must be properly licensed (Pub Cont Code § 10164) from contract award through contract acceptance.

For a non-Federal-aid contract:

1. The Bidder must be properly licensed from bid opening through contract acceptance (Bus & Prof Code § 7028.15)
2. Joint venture bidders must obtain a joint venture license before contract award (Bus & Prof Code § 7029.1)

3-1.05 INSURANCE POLICIES

The successful bidder must submit:

1. Copy of its commercial general liability policy and its excess policy or binder until such time as a policy is available, including the declarations page, applicable endorsements, riders, and other modifications in effect at the time of contract execution. Standard ISO form No. CG 0001 or similar exclusions are allowed if not inconsistent with Section 7-1.12, "Indemnification and Insurance." Allowance of additional exclusions is at the discretion of the Department.
2. Certificate of insurance showing all other required coverages. Certificates of insurance, as evidence of required insurance for the auto liability and any other required policy, shall set forth deductible amounts applicable to each policy and all exclusions that are added by endorsement to each policy. The evidence of insurance shall provide that no cancellation, lapse, or reduction of coverage will occur without 10 days prior written notice to the Department.

3. A declaration under the penalty of perjury by a CPA certifying the accountant has applied GAAP guidelines confirming the successful bidder has sufficient funds and resources to cover any self-insured retentions if the self-insured retention is over $50,000.

If the successful bidder uses any form of self-insurance for workers compensation in lieu of an insurance policy, it shall submit a certificate of consent to self-insure under Labor Code § 3700.

3-1.06 FORM FHWA-1273

For a federal-aid contract, form FHWA-1273 is included with the Contract form in the documents sent to the successful bidder for execution. Comply with its provisions. Interpret the training and promotion section as specified in section 7-1.50A.

3-1.07–3-1.08 RESERVED

3-1.09 CONTRACT EXECUTION

The successful bidder must sign the contract and return it, including the attached form FHWA-1273, to the Office Engineer along with:

1. Contract bonds
2. Documents identified in Section 3-1.05, "Insurance Policies"

For an informal-bid contract, the Office Engineer must receive these documents before the 5th business day after the bidder receives the contract. For all other contracts, the Office Engineer must receive these documents before the 10th business day after the bidder receives the contract.

The bidder's security may be forfeited for failure to execute the contract within the time specified (Pub Cont Code §§ 10181, 10182, and 10183).

The following is a copy of the Contract form:

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

CONTRACT

DES-OE-0103A (REV 03/2010)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CONTRACT NO. _____

This contract is entered into between the State of California's Department of Transportation and the Contractor named below:

_____

CONTRACTOR'S NAME

The parties agree to comply with the terms of the following exhibits that are by this reference made a part of this contract.

Exhibit A - Bid book dated _____

Exhibit B - Notice to Bidders and Special Provisions dated _____

Exhibit C - Project Plans approved _____

Exhibit D - Standard Specifications dated _____

Exhibit E - Standard Plans dated _____

Exhibit F - Addenda

Exhibits A, B, C, and F are those exhibits identified with the same contract number as this contract.

This contract has been executed by the following parties:

CONTRACTOR

CONTRACTOR'S NAME *(if other than an individual, state whether a corporation, partnership, etc.)*

BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*
PRINTED NAME AND TITLE OF PERSON SIGNING	
FEDERAL EMPLOYER IDENTIFICATION NUMBER	LICENSE NUMBER

DEPARTMENT OF TRANSPORTATION

BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*
PRINTED NAME AND TITLE OF PERSON SIGNING	

This contract has been certified as complying with the State Contract Act:

BY *(Authorized Signature)*	DATE SIGNED *(Do not type)*
PRINTED NAME AND TITLE OF PERSON SIGNING	

ADA Notice For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814.

3-1.10 BIDDERS' SECURITIES

The Department keeps the securities of the 1st, 2nd, and 3rd low bidders until the contract has been executed. The other bidders' securities, other than bidders' bonds, are returned upon determination of the 1st, 2nd, and 3rd low bidders, and their bidders' bonds are of no further effect (Pub Cont Code § 10184).

^^

SECTION 4 SCOPE OF WORK
(Issued 06-05-09)

Add to Section 4-1.01:

Nothing in the specifications voids the Contractor's public safety responsibilities.

Add:

4-1.015 PROJECT DESCRIPTION

Construct the work described in the special provisions and on project plans and by the bid items. The special provisions, project plans, and bid item descriptions set forth the specifications that apply.

Replace Section 4-1.03 with:

4-1.03 CHANGES

4-1.03A General

The Department may make changes within the scope of work and add extra work. The Engineer describes the changes and extra work, the payment basis, and any time adjustment in a Contract Change Order.

A Contract Change Order is approved when the Department signs the Contract Change Order.

Submit detailed cost data for a payment adjustment for:

1. Request for a payment adjustment for a bid item
2. Payment adjustment resulting from a change of more than 25 percent in the bid item's quantity if requested

If ordered, start the work before receipt of an approved Contract Change Order.

You may protest a Contract Change Order.

4-1.03B Increased or Decreased Quantities

The Department adjusts payment for changed quantities and eliminated items under Section 9-1.05, "Changed Quantity Payment Adjustments."

4-1.03C Changes in Character of Work

The Department adjusts payment for an item if:

1. An ordered plan or specification change materially changes the character of a work item from that on which the bid price was based
2. The unit cost of the changed item differs when compared to the unit cost of that item under the original plans and specifications
3. No approved Contract Change Order addresses the payment

The Department adjusts the payment under Section 9-1.06, "Work-Character Changes."

4-1.03D Extra Work

The Department classes new and unforeseen work as extra work if the Engineer determines that the work is not covered by any of the various items for which there is a bid price or by combinations of those items. If portions of this work are covered by some of the various items for which there is a bid price or combinations of those items, the

remaining portion of the work will be classed as extra work. Extra work also includes work specifically designated as extra work in the plans or specifications.

Add:

4-1.035 VALUE ENGINEERING

4-1.035A General

Reserved

4-1.035B Value Engineering Change Proposal

You may submit a VECP to reduce any of the following:

1. Total cost of construction
2. Construction activity duration
3. Traffic congestion

Before preparing a VECP, meet with the Engineer to discuss:

1. Proposal concept
2. Permit issues
3. Impact on other projects
4. Project impacts, including traffic, schedule, and later stages
5. Peer reviews
6. Overall proposal merits
7. Review times required by the Department and other agencies

The VECP must not impair the project's essential functions or characteristics, such as:

1. Service life
2. Operation economy
3. Maintenance ease
4. Desired appearance
5. Design and safety

The VECP must include:

1. Description of the contract specifications and drawing details for performing the work and the proposed changes.
2. Itemization of contract specifications and drawing details that would be changed.
3. Detailed cost estimate for performing the work under the existing contract and under the proposed change. Determine the estimates under Section 9-1.03, "Force Account Payment."
4. Deadline for the Engineer to decide on the changes.
5. Bid items affected and resulting quantity changes.

The Department is not required to consider a VECP. If a VECP is similar to a change in the plans or specifications being considered by the Department at the time the proposal is submitted or if the proposal is based on or similar to drawings or specifications adopted by the Department before Contract award, the Department does not accept the VECP and may make these changes without VECP payments.

Until the Department approves a change order incorporating the VECP or parts of it, continue to perform the work under the contract. If the Department does not approve a change order before the deadline stated in the VECP or other date you subsequently stated in writing, the VECP is rejected. The Department does not adjust time or payment for a rejected VECP.

The Department decides whether to accept a VECP and the estimated net construction-cost savings from adopting the VECP or parts of it.

The Department may require you to accept a share of the investigation cost as a condition of reviewing a VECP. After written acceptance, the Department considers the VECP and deducts the agreed cost.

If the Department accepts the VECP or parts of it, the Department issues a change order that:

1. Incorporates changes in the contract necessary to implement the VECP or the parts adopted
2. Includes the Department's acceptance conditions
3. States the estimated net construction-cost savings resulting from the VECP
4. Obligates the Department to pay you 50 percent of the estimated net savings

In determining the estimated net construction-cost savings, the Department excludes your VECP preparation cost and the Department's VECP investigation cost, including parts paid by you.

If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from contract time.

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department pays 60 percent of the estimated net savings in construction costs attributable to the VECP. Submit detailed traffic handling comparisons between the existing contract and the proposed change, including estimates of the traffic volumes and congestion.

The Department may apply an accepted VECP for general use on other contracts.

If an accepted VECP is adopted for general use, the Department pays only the contractor who first submitted the VECP and only to the contracts awarded to that contractor before the submission of the accepted VECP.

If the Department does not adopt a general-use VECP, an identical or similar submitted proposal is eligible for acceptance.

4-1.035C Value Analysis Workshop

Section 4-1.035C, "Value Analysis Workshop," applies to a non-building-work contract with a total bid of over $5 million.

You may request a value analysis workshop by submitting a request after contract approval.

The Department offers a value analysis workshop to:

1. Identify value enhancing opportunities
2. Consider changes to the contract that will reduce the total cost of construction, construction activity duration, or traffic congestion without impairing the essential functions specified for a VECP in Section 4-1.035B, "Value Engineering Change Proposal."

If the request is authorized, you and the Engineer:

1. Schedule a value analysis workshop
2. Select a facilitator and workshop site
3. Agree to other workshop administrative details

The workshop must be conducted under the methods described in the Department's Value Analysis Team Guide available at:

http://www.dot.ca.gov/hq/oppd/value/

The facilitator must be a certified value specialist as recognized by the Society of American Value Engineers.

The Department reimburses you for 1/2 of the workshop cost. The workshop cost is the sum of the workshop-facilitator cost and the workshop-site cost. The Department determines the workshop cost based on the facilitator and workshop-site invoice prices minus any available or offered discounts. The Department does not pay you for any other associated costs.

^^

SECTION 5 CONTROL OF WORK
(Issued 06-01-11)

Add:

5-1.005 GENERAL

Failure to comply with any specification part is a waiver of your right to an adjustment of time and payment related to that part.

After contract approval, submit documents and direct questions to the Engineer. Orders, approvals, authorizations, and requests to the Contractor are by the Engineer.

The Engineer furnishes the following in writing:

1. Approvals
2. Authorizations
3. Certifications
4. Decisions
5. Notifications
6. Orders
7. Responses

The Contractor must furnish the following in writing:

1. Assignments
2. Notifications
3. Proposals
4. Reports
5. Requests, including RFIs, sequentially numbered
6. Subcontracts
7. Test results

The Department rejects a form if it has any error or any omission.

Convert foreign language documents to English.

Use contract administration forms available at the Department's Web site.

If the last day for submitting a document falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the day specified.

Add to 5-1.01:

Failure to enforce a contract provision does not waive enforcement of any contract provision.

Add:

5-1.011 PROTESTS

You may protest an Engineer's decision by submitting an RFI under Section 5-1.145, "Requests for Information."

Add:

5-1.012 PARTNERING

5-1.012A General

The Department strives to work cooperatively with all contractors; partnering is our way of doing business. The Department encourages project partnering among the project team, made up of significant contributors from the Department and the Contractor, and their invited stakeholders.

For a project with a total bid greater than $1 million, professionally facilitated project partnering is encouraged.

For a project with a total bid greater than $10 million, professionally facilitated project partnering is required.

In implementing project partnering, you and the Engineer manage the contract by:

1. Using early and regular communication with involved parties
2. Establishing and maintaining a relationship of shared trust, equity, and commitment
3. Identifying, quantifying, and supporting attainment of mutual goals
4. Developing strategies for using risk management concepts

5. Implementing timely communication and decision making
6. Resolving potential problems at the lowest possible level to avoid negative impacts
7. Holding periodic partnering meetings and workshops as appropriate to maintain partnering relationships and benefits throughout the life of the project
8. Establishing periodic joint evaluations of the partnering process and attainment of mutual goals

Partnering does not void any contract part.

The Department's "Field Guide to Partnering on Caltrans Construction Projects" current at the time of bid is available to the project team as reference. This guide provides structure, context, and clarity to the partnering process requirements. This guide is available at the Department's Partnering Program website:

http://www.dot.ca.gov/hq/construc/partnering.html

In implementing project partnering, the project team must:

1. Create a partnering charter that includes:

    1.1. Mutual goals, including core project goals and may also include project-specific goals and mutually supported individual goals.
    1.2. Partnering maintenance and close-out plan.
    1.3. Dispute resolution plan that includes a dispute resolution ladder and may also include use of facilitated dispute resolution sessions.
    1.4. Team commitment statement and signatures.

2. Participate in monthly partnering evaluation surveys to measure progress on mutual goals and may also measure short-term key issues as they arise.
3. Evaluate the partnering facilitator on Forms CEM-5501 and CEM-5502. The Engineer provides the evaluation forms to the project team and collects the results. The Department makes evaluation results available upon request. Facilitator evaluations must be completed:

    3.1. At the end of the initial partnering workshop on Form CEM-5501.
    3.2. At the end of the project close-out partnering workshop on Form CEM-5502.

4. Conduct a project close-out partnering workshop.
5. Document lessons learned before contract acceptance.

5-1.012B Partnering Facilitator, Workshops, and Monthly Evaluation Surveys

The Engineer sends you a written invitation to enter into a partnering relationship after contract approval. Respond within 15 days to accept the invitation and request the initial and additional partnering workshops. After the Engineer receives the request, you and the Engineer cooperatively:

1. Select a partnering facilitator that offers the service of a monthly partnering evaluation survey with a 5-point rating and agrees to follow the Department's "Partnering Facilitator Standards and Expectations" available at the Department's Partnering Program website
2. Schedule initial partnering workshop
3. Determine initial workshop site and duration
4. Agree to other workshop administrative details

Additional partnering workshops and sessions are encouraged throughout the life of the project as determined necessary by you and the Engineer, recommended quarterly.

5-1.012C Training in Partnering Skills Development

For a project with a total bid of $25 million or greater, training in partnering skills development is required.

For a project with a total bid between $10 million and $25 million, training in partnering skills is optional.

You and the Engineer cooperatively schedule the training session and select a professional trainer, training site, and 1 to 4 topics from the following list to be covered in the training:

1. Active Listening
2. Building Teams
3. Change Management
4. Communication
5. Conflict Resolution
6. Cultural Diversity
7. Dealing with Difficult People
8. Decision Making
9. Effective Escalation Ladders
10. Emotional Intelligence
11. Empathy
12. Ethics
13. Facilitation Skills
14. Leadership
15. Partnering Process and Concepts
16. Project Management
17. Project Organization
18. Problem Solving
19. Running Effective Meetings
20. Time Management
21. Win-Win Negotiation

Before the initial partnering workshop, the trainer conducts a 1-day training session in partnering skills development for the Contractor's and the Engineer's representatives. This training session must be a separate session from the initial partnering workshop and must be conducted locally. The training session must be consistent with the partnering principles under the Department's "Field Guide to Partnering on Caltrans Construction Projects."

Send at least 2 representatives to the training session. One of these must be your assigned representative as specified in Section 5-1.06, "Superintendence," of the Standard Specifications.

5-1.012D Payment

The Department pays you for:

1. 1/2 of partnering workshops and sessions based on facilitator and workshop site cost
2. 1/2 of monthly partnering evaluation survey service cost
3. Partnering skills development trainer and training site cost

The Department determines the costs based on invoice prices minus any available or offered discounts. The Department does not pay markups on these costs.

The Department does not pay for wages, travel expenses, or other costs associated with the partnering workshops and sessions, monthly partnering evaluation surveys, and training in partnering skills development.

Add:

5-1.015 RECORDS

5-1.015A General

Reserved

5-1.015B Record Retention

Retain project records from bid preparation through:

1. Final payment
2. Resolution of claims, if any

For at least 3 years after the later of these, retain cost records, including records of:

1. Bid preparation
2. Overhead
3. Payrolls

4. Payments to suppliers and subcontractors
5. Cost accounting

Maintain the records in an organized way in the original format, electronic and hard copy, conducive to professional review and audit.

5-1.015C Record Inspection, Copying, and Auditing

Make your records available for inspection, copying, and auditing by State representatives for the same time frame specified under Section 5-1.015B, "Record Retention." The records of subcontractors and suppliers must be made available for inspection, copying, and auditing by State representatives for the same period. Before contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier 5 business days before inspection, copying, or auditing.

If an audit is to start more than 30 days after contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier when the audit is to start.

5-1.015D Cost Accounting Records

Maintain cost accounting records for the project distinguishing between the following work cost categories:

1. Work performed based on bid item prices
2. Work performed by change order other than extra work. Distinguish this work by:

    2.1. Bid item prices
    2.2. Force account
    2.3. Agreed price

3. Extra work. Distinguish extra work by:

    3.1. Bid item prices
    3.2. Force account
    3.3. Agreed price
    3.4. Specialist billing

4. Work performed under potential claim records
5. Overhead
6. Subcontractors, suppliers, owner-operators, and professional services

Cost accounting records must include:

1. Final cost code lists and definitions
2. Itemization of the materials used and corresponding vendor's invoice copies
3. Direct cost of labor
4. Equipment rental charges
5. Workers' certified payrolls
6. Equipment:

    6.1. Size
    6.2. Type
    6.3. Identification number
    6.4. Hours operated

5-1.015E Extra Work Bills

Maintain separate records for costs of work performed by change order.

Within 7 days after performing the work, submit extra work bills using the Department's Internet extra work billing system.

The Contractor submitting and the Engineer approving an extra work bill using the Internet force account work billing system is the same as each party signing the bill.

The Department provides billing system:

1. Training within 30 days of your written request
2. Accounts and user identification to your assigned representatives after a representative has received training

Each representative must maintain a unique password.

Replace Section 5-1.04 with:

5-1.04 CONTRACT COMPONENTS

A component in one contract part applies as if appearing in each. The parts are complementary and describe and provide for a complete work.

If a discrepancy exists:

1. The governing ranking of contract parts in descending order is:

    1.1. Special provisions
    1.2. Project plans
    1.3. Revised Standard Plans
    1.4. Standard Plans
    1.5. Amendments to the Standard Specifications
    1.6. Standard Specifications
    1.7. Supplemental project information

2. Written numbers and notes on a drawing govern over graphics
3. A detail drawing governs over a general drawing
4. A detail specification governs over a general specification
5. A specification in a section governs over a specification referenced by that section

If a discrepancy is found or confusion arises, request correction or clarification.

Add:

5-1.055 SUBCONTRACTING

5-1.055A General

No subcontract releases you from the contract or relieves you of your responsibility for a subcontractor's work.

If you violate Pub Cont Code § 4100 et seq., the Department may exercise the remedies provided under Pub Cont Code § 4110. The Department may refer the violation to the Contractors State License Board as provided under Pub Cont Code § 4111.

Except for a building-construction non-federal-aid contract, perform work equaling at least 30 percent of the value of the original total bid with your employees and with equipment owned or rented by you, with or without operators.

Each subcontract must comply with the contract.

The Department encourages you to include a dispute resolution process in each subcontract.

Each subcontractor must have an active and valid State contractor's license with a classification appropriate for the work to be performed (Bus & Prof Code, § 7000 et seq.).

Submit copies of subcontracts upon request.

Before subcontracted work starts, submit a Subcontracting Request form.

Do not use a debarred contractor; a current list of debarred contractors is available at the Department of Industrial Relations' Web site.

Upon request, immediately remove and not again use a subcontractor who fails to prosecute the work satisfactorily.

Replace Section 5-1.07 with:

5-1.07 LINES AND GRADES

The Engineer places stakes and marks under Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

Submit your request for Department-furnished stakes:

1. On a Request for Construction Stakes form. Ensure:

    1.1. Requested staking area is ready for stakes
    1.2. You use the stakes in a reasonable time

2. A reasonable time before starting an activity using the stakes

Establish priorities for stakes and note priorities on the request.

Preserve stakes and marks placed by the Engineer. If the stakes or marks are destroyed, the Engineer replaces them at the Engineer's earliest convenience and deducts the cost.

Replace Section 5-1.10 with:

5-1.10 EQUIPMENT

Clearly stencil or stamp at a clearly visible location on each piece of equipment except hand tools an identifying number and:

1. On compacting equipment, its make, model number, and empty gross weight that is either the producer's rated weight or the scale weight
2. On meters and on the load-receiving element and indicators of each scale, the make, model, serial number, and producer's rated capacity

Submit a list:

1. Describing each piece of equipment
2. Showing its identifying number

Upon request, submit producer's information that designates portable vehicle scale capacities.

For proportioning materials, use measuring devices, material plant controllers, and undersupports complying with Section 9-1.01B, "Weighing Equipment and Procedures."

Measuring devices must be tested and approved under California Test 109 in the Department's presence by any of the following:

1. County Sealer of Weights and Measures
2. Scale Service Agency
3. Division of Measurement Standards Official

The indicator over-travel must be at least 1/3 of the loading travel. The indicators must be enclosed against moisture and dust.

Group measuring system dials such that the smallest increment for each indicator can be read from the location at which proportioning is controlled.

Replace Section 5-1.116 with:

5-1.116 DIFFERING SITE CONDITIONS (23 CFR 635.109)

5-1.116A Contractor's Notification

Promptly notify the Engineer if you find either of the following:

1. Physical conditions differing materially from either of the following:

    1.1. Contract documents
    1.2. Job site examination

2. Physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract

Include details explaining the information you relied on and the material differences you discovered.

If you fail to notify the Engineer promptly, you waive the differing site condition claim for the period between your discovery of the differing site condition and your notification to the Engineer.

If you disturb the site after discovery and before the Engineer's investigation, you waive the differing site condition claim.

5-1.116B Engineer's Investigation and Decision

Upon your notification, the Engineer investigates job site conditions and:

1. Notifies you whether to resume affected work
2. Decides whether the condition differs materially and is cause for an adjustment of time, payment, or both

You may protest the Engineer's decision.

Replace Section 5-1.14 with:

5-1.14 COST REDUCTION INCENTIVE

Comply with Section 4-1.035B, "Value Engineering Change Proposal."

Add:

5-1.145 REQUESTS FOR INFORMATION

Submit an RFI upon recognition of any event or question of fact arising under the Contract.

The Engineer responds to the RFI within 5 days. Proceed with the work unless otherwise ordered. You may protest the Engineer's response by:

1. Submitting an Initial Potential Claim Record within 5 days after receipt of the Engineer's response
2. Complying with Section 5-1.146, "Potential Claims and Dispute Resolution"

Add:

5-1.146 POTENTIAL CLAIMS AND DISPUTE RESOLUTION

5-1.146A General

Minimize and mitigate impacts of potentially claimed work or event.

For each potential claim, assign an identification number determined by chronological sequencing and the 1st date of the potential claim.

Use the identification number for each potential claim on the:

1. Initial Potential Claim Record
2. Supplemental Potential Claim Record
3. Full and Final Potential Claim Record

Failure to comply with this procedure is:

1. Waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim procedure
2. Bar to arbitration (Pub Cont Code § 10240.2)

5-1.146B Initial Potential Claim Record

Submit an Initial Potential Claim Record within 5 days of the Engineer's response to the RFI or within 5 days from the date when a dispute arises due to an act or failure to act by the Engineer. The Initial Potential Claim Record establishes the claim nature and circumstances. The claim nature and circumstances must remain consistent.

The Engineer responds within 5 days of the date of the Initial Potential Claim Record. Proceed with the potentially claimed work unless ordered.

Within 20 days of a request, provide access to the project records determined necessary by the Engineer to evaluate the potential claim.

5-1.146C Supplemental Potential Claim Record

Within 15 days of submitting the Initial Potential Claim Record, submit a Supplemental Potential Claim Record including:

1. Complete nature and circumstances causing the potential claim or event
2. Contract specifications supporting the basis of a claim
3. Estimated claim cost and an itemized breakdown of individual costs stating how the estimate was determined
4. TIA

The Engineer evaluates the Supplemental Potential Claim Record and furnishes you a response within 20 days of submittal. If the estimated cost or effect on the scheduled completion date changes, update the Supplemental Potential Claim Record information as soon as the change is recognized and submit this information.

5-1.146D Full and Final Potential Claim Record

Notify the Engineer within 10 days of the completion date of the potentially claimed work. The Engineer approves this completion date or notifies you of a revised date.

Within 30 days of the completion of the potentially claimed work, submit a Full and Final Potential Claim Record including:

1. A detailed factual account of the events causing the potential claim, including:

   1.1. Necessary dates
   1.2. Locations
   1.3. Work items affected by the potential claim

2. The Contract documents supporting the potential claim and a statement of the reasons these parts support entitlement
3. If a payment adjustment is requested, an itemized cost breakdown. Segregate costs into the following categories:

   3.1. Labor, including:

      3.1.1. Individuals
      3.1.2. Classifications
      3.1.3. Regular and overtime hours worked
      3.1.4. Dates worked

   3.2. Materials, including:

      3.2.1. Invoices
      3.2.2. Purchase orders
      3.2.3. Location of materials either stored or incorporated into the work
      3.2.4. Dates materials were transported to the job site or incorporated into the work

   3.3. Equipment, including:

      3.3.1. Detailed descriptions, including make, model, and serial number
      3.3.2. Hours of use
      3.3.3. Dates of use
      3.3.4. Equipment rates at the rental rate listed in Labor Surcharge and Equipment Rental Rates in effect when the affected work related to the claim was performed

4. If a time adjustment is requested:

   4.1. Dates for the requested time.
   4.2. Reasons for a time adjustment.
   4.3. Contract documentation supporting the requested time adjustment.

4.4. TIA. The TIA must demonstrate entitlement to a time adjustment.

5. Identification and copies of your documents and copies of communications supporting the potential claim, including certified payrolls, bills, cancelled checks, job cost reports, payment records, and rental agreements
6. Relevant information, references, and arguments that support the potential claim

The Department does not consider a Full and Final Potential Claim Record that does not have the same nature, circumstances, and basis of claim as those specified on the Initial Potential Claim Record and Supplemental Potential Claim Record.

The Engineer evaluates the information presented in the Full and Final Potential Claim Record and furnishes you a response within 30 days of its receipt unless the Full and Final Potential Claim Record is submitted after Contract acceptance; in which case, a response may not be furnished. The Engineer's receipt of the Full and Final Potential Claim Record must be evidenced by postal return receipt or the Engineer's written receipt if delivered by hand.

5-1.146E Dispute Resolution

Comply with Section 5-1.15, "Dispute Resolution."

Add:

5-1.15 DISPUTE RESOLUTION

5-1.15A General

Section 5-1.15, "Dispute Resolution," applies to a contract with 100 or more working days.

The dispute resolution process is not a substitute for the submitting an RFI or a potential claim record.

5-1.15B Dispute Resolution Advisor

Section 5-1.15B, "Dispute Resolution Advisor," applies to a contract with a total bid from $3 million to $10 million.

A dispute resolution advisor, hereinafter referred to as "DRA," is chosen by the Department and the Contractor to assist in the resolution of disputes.

The DRA shall be established by the Department and the Contractor within 30 days of contract approval.

The Department and the Contractor shall each propose 3 potential DRA candidates. Each potential candidate shall provide the Department and the Contractor with their disclosure statement. The disclosure statement shall include a resume of the potential candidate's experience and a declaration statement describing past, present, anticipated, and planned relationships with all parties involved in this contract.

The Department and the Contractor shall select one of the 6 nominees to be the DRA. If the Department and the Contractor cannot agree on one candidate, the Department and the Contractor shall each choose one of the 3 nominated by the other. The final selection of the DRA will be decided by a coin toss between the two candidates.

The Department and the Contractor shall complete and adhere to the Dispute Resolution Advisor Agreement. No DRA meeting shall take place until the Dispute Resolution Advisor Agreement has been signed by all parties, unless all parties agree to sign it at the first meeting.

If DRA needs outside technical services, technical services shall be preapproved by both the Department and the Contractor.

DRA recommendations are nonbinding.

The Contractor shall not use the DRA for disputes between subcontractors or suppliers that have no grounds for a lawsuit against the Department.

DRA replacement is selected in the same manner as the original selection. The appointment of a replacement DRA will begin promptly upon determination of the need for replacement. The Dispute Resolution Advisor Agreement shall be amended to reflect the change of the DRA.

Failure of the Contractor to participate in selecting DRA will result in the withhold of 25 percent of the estimated value of all work performed during each estimate period that the Contractor fails to comply. DRA withholds will be released for payment on the next monthly progress payment following the date that the Contractor has provided assistance in choosing the DRA and no interest will be due the Contractor.

The State and the Contractor shall bear the costs and expenses of the DRA equally.

The DRA shall be compensated at an agreed rate of $1,500 per day for time spent per meeting either at the start of the project or for a dispute. A member serving on more than one State DRA or Dispute Resolution Board, regardless the number of meetings per day shall not be paid more than the agreed rate per day. The agreed rate shall

be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel, and incidentals for each day or portion thereof that the DRA is at an authorized DRA meeting.

No additional compensation will be made for time spent by the DRA to review and research activities outside the official DRA meetings unless that time, such as time spent evaluating and preparing recommendations on specific issues presented to the DRA, has been specifically agreed to in advance by the State and Contractor. Time away from the project that has been specifically agreed to in advance by the Department and the Contractor will be compensated at an agreed rate of $150 per hour. The agreed amount of $150 per hour shall include all incidentals including expenses for telephone, fax, and computer services.

The State will provide conference facilities for DRA meetings at no cost to the Contractor.

The Contractor shall make direct payments to the DRA for participation in authorized meetings and approved hourly rate charges from invoices submitted.

The State will reimburse the Contractor for the State's share of the costs.

There will be no markups applied to expenses associated with the DRA, either by the DRA or by the Contractor when requesting payment of the State's share of DRA expenses. Regardless of the DRA recommendation, neither party will be entitled to reimbursement of DRA costs from the other party.

The Contractor shall submit extra work bills and include invoices with original supporting documents for reimbursement of the State's share.

The cost of technical services will be borne equally by the State and Contractor. There will be no markups for these costs.

A copy of the "Dispute Resolution Advisor Agreement" to be executed by the Contractor, State and the DRA is as follows:

Form CEM 6206 Rev (04-06-07)

DISPUTE RESOLUTION ADVISOR AGREEMENT

_____
(Contract Identification)

Contract No. _____

THIS DISPUTE RESOLUTION ADVISOR AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ hereinafter called the "CONTRACTOR," and _____, the Dispute Resolution Advisor, hereinafter called the "DRA."

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the Standard Specifications for the above referenced contract provides for the establishment and operation of the DRA to assist in resolving disputes; and

WHEREAS, the DRA is composed of one person, chosen by the CONTRACTOR and the STATE;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRA hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the timely resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRA. The DRA is to fairly and impartially consider disputes placed before it and provide recommendations for resolution of these disputes to the parties. The DRA shall provide recommendations based on the facts related to the dispute, the contract and applicable laws and regulations. The DRA shall perform the services necessary to participate in the DRA's actions as designated in Section III, Scope of Work.

SECTION II DRA QUALIFICATIONS

The DRA shall be knowledgeable in the type of construction and contract documents anticipated by the contract and shall have completed training through the Dispute Review Board Foundation. In addition, it is desirable for the DRA to have served on several State Dispute Resolution Boards (DRB).

No DRA shall have prior direct involvement in this contract. No DRA shall have a financial interest in this contract or parties thereto, including but not limited to the CONTRACTOR, subcontractors, suppliers, consultants, and legal and business services, within a period 6 months prior to award and during this contract. Exceptions to above are compensation for services on this or other DRAs and DRBs or retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.

The DRA shall fully disclose all direct or indirect professional or personal relationships with all key members of the contract.

SECTION III SCOPE OF WORK

The Scope of Work of the DRA includes, but is not limited to, the following:

A. PROCEDURES

The DRA shall meet with the parties at the start of the project to establish procedures that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. The DRA established procedures shall only be implemented upon approval by the parties. Subsequent meetings shall be held only to hear disputes between the parties.

The DRA shall not meet with, or discuss contract issues with individual parties.

The State shall provide the DRA with the contract and all written correspondence regarding the dispute between the parties and, if available, the Contractor's supplemental potential claim record, and the Engineer's response to the supplemental potential claim record.

The parties shall not call the DRA who served on this contract as a witness in arbitration proceedings, which may arise from this contract.

The DRA shall have no claim against the STATE or the CONTRACTOR, or both, from claimed harm arising out of the parties' evaluations of the DRA's opinions.

B. DISPUTE MEETING

The term "dispute meeting" as used in this subsection shall refer to both the informal and traditional dispute meeting processes, unless otherwise noted.

If the CONTRACTOR requests a dispute meeting with the DRA, the Contractor must simultaneously notify the STATE. Upon being notified of the need for a dispute meeting, the DRA shall review and consider the dispute. The DRA shall determine the time and location of the dispute meeting with due consideration for the needs and preferences of the parties, while recognizing the importance of a speedy resolution to the dispute.

Dispute meetings shall be conducted at any location that would be convenient and provide required facilities and access to necessary documentation.

Only the STATE's Area Construction Engineer, Resident Engineer, and Structure Representative and the CONTRACTOR's or subcontractor's, Superintendent or Project Manager may present information at a dispute meeting. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute. The exception to this is technical services, as described below:

> The DRA, with approval of the parties, may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the two parties as specified in an approved contract change order. The CONTRACTOR shall not be entitled to markups for the payments made for these services.

At the dispute meeting the DRA may ask questions, seek clarification, and request further clarification of data presented by either of the parties as may be necessary to assist in making a fully informed recommendation. However, the DRA shall refrain from expressing opinions on the merits of statements on matters under dispute during the parties' presentations. Each party will be given ample time to fully present its position, make rebuttals, provide relevant documents, and respond to DRA questions and requests.

There shall be no testimony under oath or cross-examination, during DRA dispute meetings. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRA in conformance with the rules and regulations established at the first meeting between the DRA and parties. These established rules and regulations need not comply with prescribed legal laws of evidence.

Failure to attend a dispute meeting by either of the parties shall be conclusively considered by the DRA as indication that the non-attending party considers all written documents and correspondence submitted as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals at the meeting until all aspects of the dispute are thoroughly covered.

1. TRADITIONAL DISPUTE MEETING:

The following procedure shall be used for the traditional dispute meeting:

a. Within 5 days after receiving the STATE's written response to the CONTRACTOR's supplemental potential claim record, the CONTRACTOR shall refer the dispute to the DRA, if the CONTRACTOR wishes to further pursue the dispute. The CONTRACTOR shall make the referral in writing to the DRA, simultaneously copied to the STATE. The written dispute referral shall describe the disputed matter in individual discrete segments, so that it will be clear to both parties and the DRA what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.

b. The parties shall each be afforded an opportunity to be present and to be heard by the DRA, and to offer evidence. Either party furnishing written evidence or documentation to the DRA must furnish copies of such information to the other party a minimum of 10 days prior to the date the DRA is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRA may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party

at the same time the evidence is provided to the DRA. The DRA shall not consider evidence not furnished in conformance with the terms specified herein.

c. Upon receipt by the DRA of a written referral of a dispute, the DRA shall convene to review and consider the dispute. The dispute meeting shall be held no later than 25 days after receipt of the written referral unless otherwise agreed to by all parties.
d. The DRA shall furnish a written report to both parties. The DRA may request clarifying information of either party within 5 days after the DRA dispute meeting. Requested information shall be submitted to the DRA within 5 days of the DRA request. The DRA shall complete its report and submit it to the parties within 10 days of the DRA dispute meeting, except that time extensions may be granted at the request of the DRA with the written concurrence of both parties. The report shall summarize the facts considered, the contract language, law or regulation viewed by the DRA as pertinent to the dispute, and the DRA's interpretation and philosophy in arriving at its conclusions and recommendations and, if appropriate, recommends guidelines for determining compensation. The DRA's written opinion shall stand on its own, without attachments or appendices.
e. Within 10 days after receiving the DRA's report, both parties shall respond to the DRA in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRA's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRA recommendation. Immediately after responses have been received from both parties, the DRA shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRA's report from the DRA prior to responding to the report. The DRA shall consider any clarification request only if submitted within 5 days of receipt of the DRA's report, and if submitted simultaneously in writing to both the DRA and the other party. Each party may submit only one request for clarification for any individual DRA report. The DRA shall respond, in writing, to requests for clarification within 5 days of receipt of such requests.
f. Either party may seek a reconsideration of the DRA's recommendation. The DRA shall only grant reconsideration based upon submission of new evidence and if the request is submitted within the 10 day time limit specified for response to the DRA's written report. Each party may submit only one request for reconsideration regarding an individual DRA recommendation.
g. If the parties are able to settle their dispute with the aid of the DRA's report, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties. If the parties cannot agree on compensation within 30 days of the acceptance by both parties of the settlement, either party may request the DRA to make a recommendation regarding compensation.

2. INFORMAL DISPUTE MEETING

An informal dispute meeting shall be convened, only if, the parties and the DRA agree that this dispute resolution process is appropriate to settle the dispute.
The following procedure shall be used for the informal dispute meeting:

a. The parties shall furnish the DRA with one copy of pertinent documents requested by the DRA that are or may become necessary for the DRA to perform its function. The party furnishing documents shall furnish such documents to the other party at the same time the document is provided to the DRA.
b. After the dispute meeting has concluded, the DRA shall deliberate in private the same day, until a response to the parties is reached or as otherwise agreed to by the parties.
c. The DRA then verbally delivers its recommendation with findings to the parties.
d. After the recommendation is presented, the parties may ask for clarifications.
e. Occasionally the DRA, on complex issues, may be unable to formulate a recommendation based on the information given at a dispute meeting. However, the DRA may provide the parties with advice on strengths and weaknesses of their prospective positions, in the hope of the parties reaching settlement.
f. If the parties are able to settle their dispute with the aid of the DRA's opinion, the STATE and CONTRACTOR shall promptly accept and implement the settlement of the parties.
g. The DRA will not be bound by its oral recommendation in the event that a dispute is later heard by the DRA in a traditional dispute meeting.

Unless the dispute is settled, use of the informal dispute meeting does not relieve the parties of their responsibilities under Section 5-1.15B, "Dispute Resolution Advisor," of the Standard Specifications or Subsection, "Traditional Dispute Meeting," of this AGREEMENT. There will be no extension of time allowed for the process to permit the use of the informal dispute meeting, unless otherwise agreed to by the parties.

SECTION IV TIME FOR BEGINNING AND COMPLETION

Once established, the DRA shall be in operation until the day the Director accepts the contract. The DRA shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE or as agreed to by the parties.

SECTION V PAYMENT

The DRA shall be compensated at an agreed rate of $1,500 per day for time spent per meeting, either at the start of the project or for a dispute. A member serving on more than one State DRA or DRB, regardless the number of meetings per day, shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for onsite time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof that the DRA is at an authorized DRA meeting. No additional compensation will be made for time spent by the DRA to review and research activities outside the official DRA meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRA), has been specifically agreed to in advance by the parties. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of $150 per hour. The agreed amount of $150 per hour shall include all incidentals including expenses for telephone, fax, and computer services. The State will provide administrative services such as conference facilities to the DRA.

A. PAYMENT PROCESSING

The CONTRACTOR shall make direct payments to the DRA for their participation in authorized meetings and approved hourly rate charges, from invoices submitted by the DRA, and technical services.

The DRA may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to the DRA until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

B. INSPECTION OF COSTS RECORDS

The DRA and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VI ASSIGNMENT OF TASKS OF WORK

The DRA shall not assign the work of this AGREEMENT.

SECTION VII TERMINATION OF DRA

The DRA may resign after providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. The DRA may be terminated, by either party, for failing to fully comply at all times with all required employment or financial disclosure conditions of DRA membership in conformance with the terms of the contract and this AGREEMENT. Each party shall document the need for replacement and substantiate the replacement request in writing to the other party and the DRA.

SECTION VIII LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRA in the performance of duties is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRA from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRA.

SECTION IX CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRA, which documents and records are marked "Confidential - for use by the DRA only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRA findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of this AGREEMENT. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRA. However, the parties understand that such documents may be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION X DISPUTES

Disputes between the parties arising out of the work or other terms of this AGREEMENT that cannot be resolved by negotiation and mutual concurrence between the parties or through the administrative process provided in the contract shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications. Disputes between the DRA and the parties that cannot be resolved by negotiation and mutual concurrence shall be resolved in the appropriate forum.

SECTION XI VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including the DRA, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRA in progress, except for private meetings or deliberations of the DRA.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIII CERTIFICATION OF CONTRACTOR, DRA, AND STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRA

By: _____

Title: _____

CONTRACTOR	CALIFORNIA DEPARTMENT OF TRANSPORTATION
By: _____	By: _____
Title: _____	Title: _____

5-1.15C Dispute Resolution Board

Section 5-1.15C, "Dispute Resolution Board," applies to a contract with a total bid of over $10 million.

The Dispute Resolution Board, hereinafter referred to as "DRB," is a three member board established by the Department and Contractor to assist in the resolution of disputes.

The DRB shall be established by the Department and the Contractor within 45 days after contract approval.

The DRB shall consist of one member selected by the Department and approved by the Contractor, one member selected by the Contractor and approved by the Department, and a third member selected by the first 2 members and approved by both the Department and the Contractor.

The Department and Contractor shall provide the other written notification for approval of the name of their DRB nominee along with the nominee's disclosure statement.

Disclosure statements shall include a resume of the nominee's experience and a declaration statement describing past, present, anticipated, and planned relationships with all parties involved in this contract. Objections to nominees shall be based on a specific breach or violation of nominee responsibilities or on nominee qualifications. The Department or the Contractor may, on a one-time basis, object to the other's nominee without specifying a reason and this person shall not be selected for the DRB. Another person shall then be nominated within 15 days.

The 2 DRB members shall proceed with the selection of the third DRB member immediately after receiving written notification from the Department of their selection. The 2 DRB members shall provide their recommendation simultaneously to the parties within 15 days. The third member shall provide disclosure statement to the first 2 DRB members, to the Department, and the Contractor. The professional experience of the third DRB member shall complement that of the first 2 DRB members. The third DRB member shall be subject to mutual approval of the Department and the Contractor. If the 2 DRB members cannot agree on the third nominee, they shall submit a list of nominees to the Department and the Contractor for final selection and approval.

If the Department and the Contractor cannot agree on the third DRB member, or if the first 2 DRB members are unable to agree upon a recommendation, the Department and the Contractor shall select 6 names from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 of the State Contract Act. The 2 DRB members shall then select one of the 6 names by a blind draw.

The 3 DRB members shall appoint one member as a chairperson to provide leadership for the DRB's activities. The chairperson shall be approved by the Department and the Contractor. In the event of an impasse, the third DRB member shall become the chairperson.

The Department and Contractor shall complete and adhere to the Dispute Resolution Board Agreement. No DRB meeting shall take place until the Dispute Resolution Board Agreement has been signed by all parties, unless all parties agree to sign it at the first meeting.

If the DRB needs outside technical services, technical services shall be preapproved by both the Department and the Contractor.

DRB recommendations are nonbinding.

The Contractor shall not use the DRB for disputes between the subcontractors or suppliers that have no grounds for a lawsuit against the Department.

DRB member replacements are selected in the same manner as the original selection. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement. The Dispute Resolution Board Agreement shall be amended to reflect the change in the DRB.

Failure of the Contractor to participate in establishing the DRB will result in the withholding of 25 percent of the estimated value of all work performed during each estimate period that the Contractor fails to comply. DRB withholds will be released for payment on the next monthly progress payment following the date that the Contractor has provided assistance in establishing the DRB and no interest will be due the Contractor.

The Department and the Contractor shall bear the costs and expenses of the DRB equally.

Each DRB member shall be compensated at an agreed rate of $1,500 per day for time spent per meeting either at the start of the project, for scheduled progress, or dispute meetings. A member serving on more than one Department DRB or Dispute Resolution Advisor (DRA), regardless of the number of meetings per day shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel, and incidentals for each day or portion thereof that the DRB member is at an authorized DRB meeting.

No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, such as time spent evaluating and preparing recommendations on specific issues presented to the DRB, has been specifically agreed to in advance by the Department and Contractor. Time away from the project, which has been specifically agreed to in advance by the Department and Contractor, will be compensated at an agreed rate of $150 per hour. The agreed amount of $150 per hour shall include all incidentals including expenses for telephone, fax, and computer services.

The Department will provide conference facilities for DRB meetings at no cost to the Contractor.

The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member.

The Department will reimburse the Contractor for the Department's share of the costs.

There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the Department's share of DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

The Contractor shall submit extra work bills and include evidence of every payment to each DRB member in the form of a cancelled check or bank statement within 30 days of payment.

The cost of technical services requested by the DRB will be borne equally by the State and Contractor. There will be no markups for these costs.

A copy of the "Dispute Resolution Board Agreement" to be executed by the Department, Contractor, and the 3 DRB members after approval of the contract follows:

DISPUTE RESOLUTION BOARD AGREEMENT

_____
(Contract Identification)

Contract No. _____

THIS DISPUTE RESOLUTION BOARD AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ _____ hereinafter called the "CONTRACTOR," and the Dispute Resolution Board, hereinafter called the "DRB" consisting of the following members:

_____ ,
(DRB Member)

_____ ,
(DRB Member)

and _____
(DRB Chairperson)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the Standard Specifications for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties; and

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the timely resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The DRB is to fairly and impartially consider disputes placed before it and provide recommendations for resolution of these disputes to the parties. The DRB shall provide recommendations based on the facts related to the dispute, the contract and applicable laws and regulations. The DRB shall perform the services necessary to participate in the DRB's actions as designated in Section III, Scope of Work.

SECTION II DRB QUALIFICATIONS

DRB members shall be knowledgeable in the type of construction and contract documents anticipated by the contract and shall have completed training through the Dispute Review Board Foundation.

No DRB member shall have prior direct involvement in this contract. No DRB member shall have a financial interest in this contract or parties thereto, including but not limited to the CONTRACTOR, subcontractors, suppliers, consultants, and legal and business services, within a period 6 months prior to award and during this contract. Exceptions to above are compensation for services on this or other DRBs and DRAs or retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.

DRB members shall fully disclose all direct or indirect professional or personal relationships with all key members of the contract.

SECTION III SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

A. PROCEDURES

The DRB shall establish procedures that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. The DRB established procedures shall only be implemented upon approval of the parties.

The DRB Chairperson shall schedule progress and dispute meetings and any other DRB activities.

The parties shall not call on any of the DRB members, who served on this contract, as a witness in arbitration proceedings, which may arise from this contract.

DRB members shall have no claim against the STATE or the CONTRACTOR, or both, from claimed harm arising out of the parties' evaluations of the DRB's opinions.

During progress or dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties. Discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

B. PROGRESS MEETINGS

DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Scheduled progress meetings may be waived, if the parties are in agreement, when the only work remaining is plant establishment work. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the STATE's representative of the status of the work as the STATE views it.
5. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
6. A brief description by the CONTRACTOR's and the STATE's representative of potential claims and disputes that have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past potential claims and disputes.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

C. DISPUTE MEETING

The term "dispute meeting" as used in this subsection shall refer to both the informal and traditional dispute meeting processes, unless otherwise noted.

Either the STATE or the CONTRACTOR may request a dispute meeting with the DRB. The requesting party shall simultaneously notify the other party of each dispute meeting request. Upon being notified of the need for a dispute meeting, the DRB shall review and consider the dispute. The DRB shall determine the time and location of the dispute meeting with due consideration for the needs and preferences of the parties, while recognizing the importance of a speedy resolution to the dispute.

Dispute meetings shall be conducted at any location that would be convenient and provide required facilities and access to necessary documentation.

No DRB dispute meeting shall take place later than 30 days prior to acceptance of the contract.

Only the STATE's Area Construction Engineer, Resident Engineer, and Structure Representative and the CONTRACTOR's or subcontractor's, Superintendent or Project Manager may present information at a dispute meeting. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute. The exception to this is technical services, as described below:

> The DRB, with approval of the parties, may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the two parties as specified in an approved contract change order. The CONTRACTOR shall not be entitled to markups for the payments made for these services.

At the dispute meeting the DRB may ask questions, seek clarification, and request further clarification of data presented by either of the parties as may be necessary to assist in making a fully informed recommendation. However, the DRB shall refrain from expressing opinions on the merits of statements on matters under dispute during the parties' presentations. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals at the meeting until all aspects of the dispute are thoroughly covered. Each party will be given ample time to fully present its position, make rebuttals, provide relevant documents, and respond to DRB questions and requests.

There shall be no testimony under oath or cross-examination, during DRB dispute meetings. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with the procedures established at the first meeting between the DRB and the parties. These established procedures need not comply with prescribed legal laws of evidence.

Failure to attend a dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers all written documents and correspondence submitted as their entire and complete argument.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by two or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB shall make every effort to reach a unanimous decision.

1. TRADITIONAL DISPUTE MEETING:

The following procedure shall be used for the traditional dispute meeting:

a. Within 21 days after receiving the STATE's written response to the CONTRACTOR's supplemental potential claim record, the CONTRACTOR shall refer the dispute to the DRB if the CONTRACTOR wishes to further pursue the dispute. The CONTRACTOR shall make the referral in writing to the DRB, simultaneously copied to the STATE. The written dispute referral shall describe the disputed matter in individual discrete segments, so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.

b. The parties shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 15 days prior to the date the DRB is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB shall not consider evidence not furnished in conformance with the terms specified herein.

c. Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral unless otherwise agreed to by all parties.

d. The DRB may request clarifying information of either party within 10 days after the dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request.

e. The DRB shall furnish a written report to the parties with its conclusion(s) and recommendation(s). The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of the parties. The report shall summarize the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the dispute, and the DRB's interpretation and reasoning in arriving at its conclusion(s) and recommendation(s) and, if appropriate, recommends

guidelines for determining compensation. The DRB's written opinion shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

f. Within 30 days after receiving the DRB's report, the parties shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation or a written response requesting the DRB reconsider their recommendation, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received from both parties, the DRB shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB shall consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.

g. Either party may seek a reconsideration of the DRB's recommendation. The DRB shall only grant reconsideration based upon submission of new evidence and if the request is submitted within the 30 day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.

h. If the parties are able to settle their dispute with the aid of the DRB's report, the STATE and the CONTRACTOR shall promptly accept and implement the settlement of the parties. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the settlement, either party may request the DRB to make a recommendation regarding compensation.

2. INFORMAL DISPUTE MEETING

An informal dispute meeting shall be convened, only if, the parties and the DRB agree that this dispute resolution process is appropriate to settle the dispute.

The following procedure shall be used for the informal dispute meeting:

a. The parties shall furnish the DRB with one copy of pertinent documents requested by the DRB that are or may become necessary for the DRB to perform its function. The party furnishing documents shall furnish such documents to the other party at the same time the document is provided to the DRB.

b. After the dispute meeting has concluded, the DRB members shall deliberate in private the same day until a response to the parties is reached or as otherwise agreed to by the parties.

c. The DRB then verbally delivers its recommendation with findings, including minority opinion, if any, to the parties.

d. After the recommendation is presented, the parties may ask for clarifications.

e. Occasionally the DRB may be unable to formulate a recommendation based on the information given at a dispute meeting. However, the DRB may provide the parties with advice on strengths and weaknesses of their prospective positions, in the hope of the parties reaching settlement.

f. If the parties are able to settle their dispute with the aid of the DRB's opinion, the STATE and the CONTRACTOR shall promptly accept and implement the settlement of the parties.

g. The DRB will not be bound by its verbal recommendation in the event that a dispute is later heard by the DRB in a traditional dispute meeting.

Unless the dispute is settled, use of the informal dispute meeting does not relieve the parties of their responsibilities under Section 5-1.15C, "Dispute Resolution Board," of the Standard Specifications or subsection, "Traditional Dispute Meeting," of this AGREEMENT. There will be no extension of time allowed for the process to permit the use of the informal dispute meeting, unless otherwise agreed to by the parties.

SECTION IV TIME FOR BEGINNING AND COMPLETION

DRB members shall not begin work under the terms of this AGREEMENT, until authorized in writing by the STATE or as agreed to by the parties. Once established, the DRB shall be in operation until the Director accepts the contract. If the contract is terminated in accordance with Section 8-1.08, "Termination of Control," of the Standard Specifications, the DRB will be dissolved.

SECTION V PAYMENT

Each DRB member shall be compensated at an agreed rate of $1,500 per day for time spent per meeting, either at start of project, or a scheduled progress or a dispute meeting. A member serving on more than one State DRB or DRA, regardless of the number of meetings per day, shall not be paid more than the agreed rate per day. The agreed rate shall be considered full compensation for on site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB member to review and research activities outside the official DRB meetings unless that time, such as time spent evaluating and preparing recommendations on specific issues presented to the DRB, has been specifically agreed to in advance by the parties. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of $150 per hour. The agreed amount of $150 per hour shall include all incidentals including expenses for telephone, fax, and computer services. The State will provide administrative services such as conference facilities to the DRB.

A. PAYMENT PROCESSING

The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges, from invoices submitted by each DRB member, and technical services.

DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and the CONTRACTOR.

B. INSPECTION OF COSTS RECORDS

DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States federal government, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VI ASSIGNMENT OF TASKS OF WORK

DRB members shall not assign the work of this AGREEMENT.

SECTION VII TERMINATION OF A DRB MEMBER

DRB members may resign after providing not less than 15 days written notice of their resignation to the STATE and the CONTRACTOR. A DRB member may be terminated, by either party, for failing to comply at all times with all required employment or financial disclosure conditions of DRB membership in conformance with the terms of the contract and this AGREEMENT.

Service of a DRB member may be terminated at any time with not less than 15 days notice as follows:

A. The State may terminate service of the State appointed member.
B. The Contractor may terminate service of the Contractor appointed member.
C. Upon the written recommendation of the State and Contractor appointed members for the removal of the third member.
D. Upon resignation of a member.

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 15 days. Changes in either of the DRB members chosen by the 2 parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Resolution Board Agreement shall be amended to reflect the change of a DRB member.

Each party shall document the need for replacement and substantiate the replacement request in writing to the other party and DRB members.

SECTION VIII LEGAL RELATIONS

The parties hereto mutually understand and agree that each DRB member in the performance of duties is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

SECTION IX CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of this AGREEMENT. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents may be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION X DISPUTES

Disputes between the parties arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications. Disputes between the DRB and either party, which cannot be resolved by negotiation and mutual concurrence, shall be resolved in the appropriate forum.

SECTION XI VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB that do not become part of the project records.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIII CERTIFICATION OF CONTRACTOR, DRB, AND STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER	DRB MEMBER
By: _____	By: _____
Title: _____	Title :_____

DRB CHAIRPERSON

By :_____

Title :_____

CONTRACTOR

By: _____

Title: _____

CALIFORNIA DEPARTMENT
OF TRANSPORTATION

By: _____

Title: _____

Add:

5-1.16–5-17 (BLANK)

Add:

5-1.18 PROPERTY AND FACILITY PRESERVATION

5-1.18A General

Preserve property and facilities, including:

1. Adjacent property
2. Department's instrumentation
3. ESAs
4. Lands administered by other agencies
5. Railroads and railroad equipment
6. Roadside vegetation not to be removed
7. Utilities
8. Waterways

Immediately report damage to the Engineer.

If you cause damage, you are responsible.

Install sheet piling, cribbing, bulkheads, shores, or other supports necessary to support existing facilities or support material carrying the facilities.

Dispose of temporary facilities when they are no longer needed.

If you damage plants not to be removed:

1. Dispose of them outside the right of way unless the Engineer allows you to reduce them to chips and spread the chips within the highway at locations designated by the Engineer
2. Replace them

Replace plants with plants of the same species.

Replace trees with 24-inch-box trees.

Replace shrubs with No. 15 container shrubs.

Replace ground cover plants with plants from flats. Replace Carpobrutus ground cover plants with plants from cuttings. Plant ground cover plants 1 foot on center.

If a plant establishment period is specified, replace plants before the start of the plant establishment period; otherwise, replace plants at least 30 days before Contract acceptance.

Water each plant immediately after planting and saturate the backfill soil around and below the roots or ball of earth around the roots of each plant. Water as necessary to maintain plants in a healthy condition until Contract acceptance.

The Department may make a temporary repair to restore service to a damaged facility.

If working on or adjacent to railroad property, do not interfere with railroad operations.

For an excavation on or affecting railroad property, submit work plans showing the system to be used to protect railroad facilities. Allow 65 days for the Engineer's review of the plans. Do not perform work based on the plans until the Engineer notifies you they are accepted.

5-1.18B Nonhighway Facilities (Including Utilities)

The Department may rearrange a nonhighway facility during the Contract. Rearrangement of a nonhighway facility includes installation, relocation, alteration, or removal of the facility.The Department may authorize facility owners and their agents to enter the highway to perform rearrangement work for their facilities or to make connections or repairs to their property. Coordinate activities to avoid delays.

Notify the Engineer at least 3 business days before you contact the regional notification center under Govt Code § 4216 et seq. Failure to contact the notification center prohibits excavation.

Before starting work that could damage or interfere with underground infrastructure, locate the infrastructure described in the Contract, including laterals and other appurtenances, and determine the presence of other underground infrastructure inferred from visible facilities such as buildings, meters, or junction boxes.

Notify the Engineer if the infrastructure described in the Contract cannot be found. If after giving the notice, you find the infrastructure in a substantially different location than described, finding the infrastructure is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

Underground infrastructure described in the Contract may be in different locations than described, and additional infrastructure may exist.

Upon discovering an underground main or trunk line not described in the Contract, immediately notify the Engineer and the infrastructure owner. The Engineer orders the locating and protecting of the infrastructure. The locating and protecting is paid for as extra work as specified in Section 4-1.03D, "Extra Work." If ordered, repair infrastructure damage. If the damage is not due to your negligence, the repair is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If necessary underground infrastructure rearrangement is not described in the Contract, the Engineer may order you to perform the work. The rearrangement is paid for as extra work as specified in Section 4-1.03D, "Extra Work."

If you want infrastructure rearrangement different from that described in the Contract:

1. Notify the Engineer
2. Make an arrangement with the infrastructure owner
3. Obtain authorization for the rearrangement
4. The Department does not adjust time or payment for rearrangement different from the Contract
5. Pay the infrastructure owner any additional cost

Immediately notify the Engineer of a delay due to the presence of main line underground infrastructure not described in the Contract or in a substantially different location or due to rearrangement different from the Contract. The Department pays for one of these delays in the same manner as specified for a right of way delay in Section 8-1.09, "Right of Way Delays."

^^

SECTION 6 CONTROL OF MATERIALS
(Issued 05-01-09)

Replace Section 6-1.05 with:

6-1.05 SPECIFIC BRAND OR TRADE NAME AND SUBSTITUTION

A reference to a specific brand or trade name establishes a quality standard and is not intended to limit competition. You may use a product that is equal to or better than the specified brand or trade name if approved.

Submit a substitution request within a time period that:

1. Follows Contract award
2. Allows 30 days for review
3. Causes no delay

Include substantiating data with the substitution request that proves the substitution:

1. Is of equal or better quality and suitability
2. Causes no delay in product delivery and installation

Add:

6-1.075 GUARANTEE

Guarantee the work remains free from substantial defects for 1 year after contract acceptance except for work parts for which you were relieved of maintenance and protection. Guarantee each of these relieved work parts for 1 year after the relief date.

The guarantee excludes damage or displacement caused by an event outside your control including:

1. Normal wear and tear

2. Improper operation
3. Insufficient maintenance
4. Abuse
5. Unauthorized change
6. Act of God

During the guarantee period, repair or replace each work portion having a substantial defect.

The Department does not pay for corrective work.

During corrective work activities, provide insurance coverage specified for coverage before contract acceptance.

The contract bonds must be in full force and effect until the later of:

1. Expiration of guarantee period
2. Completion of corrective work

If a warranty specification conflicts with Section 6-1.075, "Guarantee," comply with the warranty specification.

During the guarantee period, the Engineer monitors the completed work. If the Engineer finds work having a substantial defect, the Engineer lists work parts and furnishes you the list.

Within 10 days of receipt of the list, submit for authorization a detailed plan for correcting the work. Include a schedule that includes:

1. Start and completion dates
2. List of labor, equipment, materials, and any special services you plan to use
3. Work related to the corrective work, including traffic control and temporary and permanent pavement markings

The Engineer notifies you when the plan is authorized. Start corrective work and related work within 15 days of notice.

If the Engineer determines corrective work is urgently required to prevent injury or property damage:

1. The Engineer furnishes you a request to start emergency repair work and a list of parts requiring corrective work
2. Mobilize within 24 hours and start work
3. Submit a corrective work plan within 5 days of starting emergency repair work

If you fail to perform work as specified, the Department may perform the work and bill you.

In Section 6-1.08 delete the 2nd paragraph.

Add:

6-1.085 BUY AMERICA (23 CFR 635.410)

For a Federal-aid contract, furnish steel and iron materials to be incorporated into the work that are produced in the United States except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials [60 Fed Reg 15478 (03/24/1995)]
2. If the total combined cost of the materials does not exceed the greater of 0.1 percent of the total bid or $2,500, material produced outside the United States may be used

Production includes:

1. Processing steel and iron materials, including smelting or other processes that alter the physical form or shape (such as rolling, extruding, machining, bending, grinding, and drilling) or chemical composition
2. Coating application, including epoxy coating, galvanizing, and painting, that protects or enhances the value of steel and iron materials

For steel and iron materials to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies all production processes occurred in the United States except for the above exceptions.

Add:

6-1.087 BUY AMERICA (PUB RES CODE § 42703(d))

Furnish crumb rubber to be incorporated into the work that is produced in the United States and is derived from waste tires taken from vehicles owned and operated in the United States.

For crumb rubber to be incorporated into the work, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications that certifies only crumb rubber manufactured in the United States and derived from waste tires taken from vehicles owned and operated in the United States is used.

In Section 6-2.01 delete the 4th paragraph.

In Section 6-2.01 replace the 7th paragraph with:

Upon the Contractor's written request, the Department tests materials from an untested local source. If satisfactory material from that source is used in the work, the Department does not charge the Contractor for the tests; otherwise, the Department deducts the test cost.

In Section 6-2.01 delete the 8th paragraph.

In Section 6-2.02 delete the 3rd paragraph.

In Section 6-2.02 in the 7th paragraph, replace the 2nd sentence with:

The Department deducts the charges for the removed material.

In Section 6-2.03 in the 3rd paragraph, replace the 5th sentence with:

No allowance or additional compensation will be made for lost time or for delay in completing the work due to moving the Contractor's plant from the designated mandatory source to the alternative mandatory source, other than a time adjustment as specified in Section 8-1.09, "Delays."

In Section 6-3.01 delete the 4th paragraph.

In Section 6-3.01 in the 6th paragraph, delete the 1st sentence.

In Section 6-3.01 add:

As used in Section 6-3.01, "Testing," tests are tests to assure the quality and to determine the acceptability of the work.

The Department deducts costs of testing work found to be noncompliant.

^^

SECTION 7 LEGAL RELATIONS AND RESPONSIBILITY
(Issued 07-27-12)

Replace Section 7-1.01 with:

7-1.01 LAWS TO BE OBSERVED

Comply with laws, regulations, orders, decrees, and PLACs applicable to the project. Indemnify and defend the State against any claim or liability arising from the violation of a law, regulation, order, decree, or PLAC by you or your employees. Immediately report to the Engineer in writing a discrepancy or inconsistency between the contract and a law, regulation, order, decree, or PLAC.

In Section 7-1.01A replace the 1st clause with:

Work on the job site must comply with Labor Code §§ 1727 and 1770-1815 and 8 CA Code of Regs § 16000 et seq. Work includes roadside production and processing of materials.

In Section 7-1.01A(2) in the 1st paragraph, replace item 3 with:

3. Upon becoming aware of the subcontractor's failure to pay the specified prevailing rate of wages to the subcontractor's workers, the Contractor must diligently take corrective action to stop or rectify the failure, including withholding sufficient funds due the subcontractor for work performed on the public works project.

In Section 7-1.01A(2), replace the 2nd paragraph with:

Pursuant to Section 1775 of the Labor Code, the Division of Labor Standards Enforcement must notify the Contractor on a public works project within 15 days of the receipt by the Division of Labor Standards Enforcement of a complaint of the failure of a subcontractor on that public works project to pay workers the general prevailing rate of per diem wages. If the Division of Labor Standards Enforcement determines that employees of a subcontractor were not paid the general prevailing rate of per diem wages and if the Department did not withhold sufficient money under the contract to pay those employees the balance of wages owed under the general prevailing rate of per diem wages, the Contractor must withhold an amount of moneys due the subcontractor sufficient to pay those employees the general prevailing rate of per diem wages if requested by the Division of Labor Standards Enforcement. The Contractor must pay any money withheld from and owed to a subcontractor upon receipt of notification by the Division of Labor Standards Enforcement that the wage complaint has been resolved. If notice of the resolution of the wage complaint has not been received by the Contractor within 180 days of the filing of a valid notice of completion or acceptance of the public works project, whichever occurs later, the Contractor must pay all moneys withheld from the subcontractor to the Department. The Department withholds these moneys pending the final decision of an enforcement action.

In Section 7-1.01A(2) replace 7th paragraph with:

Changes in general prevailing wage determinations apply to the contract when the Director of Industrial Relations has issued them at least 10 days before advertisement (Labor Code § 1773.6 and 8 CA Code of Regs 16204).

In Section 7-1.01A(3) replace the 2nd paragraph with:

The Department withholds the penalties specified in subdivision (g) of Labor Code § 1776 for noncompliance with the requirements in Section 1776.

In Section 7-1.01A(3) replace the 4th paragraph with:

The Department withholds for delinquent or inadequate payroll records (Labor Code § 1771.5). If the Contractor has not submitted an adequate payroll record by the month's 15th day for the period ending on or before the 1st of that month, the Department withholds 10 percent of the monthly progress estimate, exclusive of mobilization. The Department does not withhold more than $10,000 or less than $1,000.

In Section 7-1.01A(3) delete the 5th paragraph.

Replace Section 7-1.01A(6) with:

7-1.01A(6) (Blank)

Replace Section 7-1.01A(7) with:

7-1.01A(7) (Blank)

Replace Section 7-1.01F with:

7-1.01F Environmental Stewardship

Comply with Section 14.

Replace Section 7-1.01I with:

7-1.01I (Blank)

In Section 7-1.02 in the 2nd paragraph, replace the 4th sentence with:

Trucks used to haul treated base, portland cement concrete, or hot mix asphalt shall enter onto the base to dump at the nearest practical entry point ahead of spreading equipment.

In Section 7-1.02 between the 4th and 5th paragraphs, add:

Loads imposed on existing, new, or partially completed structures shall not exceed the load carrying capacity of the structure or any portion of the structure as determined by AASHTO LRFD with interims and California Amendments, Design Strength Limit State II. The compressive strength of concrete (f'_c) to be used in computing the load carrying capacity shall be the smaller of the following:

1. Actual compressive strength at the time of loading
2. Value of f'_c shown on the plans for that portion of the structure or 2.5 times the value of f_c (extreme fiber compressive stress in concrete at service loads) shown on the plans for portions of the structure where no f'_c is shown

Replace Section 7-1.04 with:

7-1.04 PERMITS, LICENSES, AGREEMENTS, AND CERTIFICATIONS

7-1.04A General

Comply with PLACs. The Department makes PLAC changes under Section 4-1.03, "Changes."

7-1.04B Before Award

To make a change to a PLAC made available to you before award, submit the proposed change. The Department sends the proposed change to the appropriate authority for consideration.

7-1.04C After Award

Confirm with the Engineer which after-award PLACs are obtained by the Department and which are obtained by the Contractor.

To make a change to an after-award PLAC obtained by the Department, submit the proposed change. The Department sends the proposed change to the appropriate authority for consideration.

Obtain those PLACs to be issued to you and pay fees and costs associated with obtaining them. Submit copies of Contractor-obtained after-award PLACs for review.

In Section 7-1.06 in the 1st paragraph, add:

The Contractor's Injury and Illness Prevention Program shall be submitted to the Engineer. The program shall address the use of personal and company issued electronic devices during work. The use of entertainment and personal communication devices in the work zone shall not be allowed. Workers may use a communication device for business purposes in the work area, at a location where their safety and the safety of other workers and the traveling public is not compromised.

Replace Section 7-1.07 with:

7-1.07 Lead Compliance Plan

Section 7-1.07 applies if a bid item for a lead compliance plan is included in the Contract.

Prepare a work plan to prevent or minimize worker exposure to lead while managing and handling earth materials, paint system debris, traffic stripe residue, and pavement marking residue containing lead. Regulations containing specific Cal/OSHA requirements when working with lead include 8 CA Code of Regs § 1532.1.

The plan must contain the items listed in 8 CA Code of Regs § 1532.1(e)(2)(B). Before submittal, a CIH must sign and seal the plan. Submit the plan at least 7 days before starting any activity that presents the potential for lead exposure. The Engineer notifies you of the acceptability of the plan within 4 business days of receipt.

Before starting any activity that presents the potential for lead exposure to employees who have no prior training, including State employees, provide a safety training program to these employees that complies with 8 CA Code of Regs § 1532.1 and your lead compliance program.

Submit copies of air monitoring or job site inspection reports made by or under the direction of the CIH under 8 CA Code of Regs § 1532.1 within 10 days after the date of monitoring or inspection.

Supply personal protective equipment, training, and washing facilities required by your lead compliance plan for 5 State employees.

The contract lump sum price paid for lead compliance plan includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and implementing the plan as specified in this section.

Replace Section 7-1.08 with:

7-1.08 PUBLIC CONVENIENCE

Compliance with the provisions of this section does not relieve you of your responsibility for public safety.

Construction activities must not inconvenience the public or abutting property owners. Schedule and conduct work to avoid unnecessary inconvenience to the public and abutting property owners. Avoid undue delay in construction activities to reduce the public's exposure to construction.

Where possible, route traffic on new or existing paved surfaces.

Maintain convenient access to driveways, houses, and buildings. When the abutting property owner's access across the right of way line is to be eliminated or replaced under the contract, the existing access must not be closed until the replacement access facilities are usable. Construct temporary approaches to crossings and intersecting highways.

Provide a reasonably smooth and even surface for use by traffic at all time during excavation of roadways and construction of embankments. Before other grading activities, place fill at culverts and bridges to allow traffic to cross. If ordered, excavate roadway cuts in layers and construct embankments in partial widths at a time alternating construction from one side to the other and routing traffic over the side opposite the one under construction. Install or construct culverts on only 1/2 the width of the traveled way at a time; keep the traveled way portion being used by traffic open and unobstructed until the opposite side of the traveled way is ready for use by traffic.

Upon completion of rough grading or placing any subsequent layer, bring the surface of the roadbed to a smooth and even condition, free of humps and depressions and satisfactory for the use of the public.

After subgrade preparation for a specified layer of material has been completed, repair any damage to the roadbed or completed subgrade, including damage due to use by the public.

While subgrade and paving activities are underway, allow the public to use the shoulders. If half-width paving methods are used, allow the public to use the side of the roadbed opposite the one under construction. If enough width is available, keep open a passageway wide enough to accommodate at least 2 lanes of traffic at locations where subgrade and paving activities are underway. Shape shoulders or reshape subgrade as necessary to accommodate traffic during subgrade preparation and paving activities.

Apply water or dust palliative for the prevention or alleviation of dust nuisance.

Install signs, lights, flares, temporary railing (Type K), barricades and other facilities to direct traffic. Furnish flaggers whenever necessary to direct the movement of the public through or around the work.

You will be required to pay the cost of replacing or repairing all facilities installed under extra work for the convenience or direction or warning of the public which are lost while in your custody, or are damaged by your operations to such an extent as to require replacement or repair.

The Engineer may order or consent to your request to open a completed section of surfacing, pavement, or structure roadway surface for public use. You will not be compensated for any delay to your construction activities caused by the public. This does not relieve you from any other contractual responsibility.

Replace Section 7-1.09 with:

7-1.09 PUBLIC SAFETY

You are responsible to provide for public safety.

Do not construct a temporary facility that interferes with the safe passage of traffic.

Control dust resulting from the work, inside and outside the right-of-way.

Move workers, equipment, and materials without endangering traffic.

Whenever your operations create a condition hazardous to the public, furnish, erect and maintain those fences, temporary railing, barricades, lights, signs, and other devices and take any other necessary protective measures to prevent damage or injury to the public.

Any fences, temporary railing, barricades, lights, signs, or other devices furnished, erected and maintained by you are in addition to those for which payment is provided elsewhere in the specifications.

Provide flaggers whenever necessary to ensure that the public is given safe guidance through the work zone. Except as ordered, at locations where traffic is being routed through construction under one-way controls, move your equipment in compliance with the one-way controls.

Use of signs, lights, flags, or other protective devices must conform with the California MUTCD and as ordered. Signs, lights, flags or other protective devices must not obscure the visibility of, nor conflict in intent, meaning and function of either existing signs, lights and traffic control devices or any construction area signs or traffic control devices.

Keep existing traffic signals and highway lighting in operation. Other entities perform routine maintenance of these facilities during the work.

Cover signs that direct traffic to a closed area. Providing, maintaining, and removing the covers on construction area signs is paid as extra work under Section 4-1.03D, "Extra Work."

Install temporary illumination in a manner which the illumination and the illumination equipment does not interfere with public safety. The installation of general roadway illumination does not relieve you from furnishing and maintaining any protective devices.

Equipment must enter and leave the highway via existing ramps and crossovers and must move in the direction of public traffic. All movements of workmen and construction equipment on or across lanes open to public traffic must be performed in a manner that will not endanger the public. Your vehicles or other mobile equipment leaving an open traffic lane to enter the construction area, must slow down gradually in advance of the location of the turnoff to give traffic following an opportunity to slow down. When leaving a work area and entering a roadway carrying public traffic, your vehicles and equipment must yield to public traffic.

Immediately remove hauling spillage from roadway lanes or shoulders open to traffic. When hauling on roadways, trim loads and remove material from shelf areas to minimize spillage.

Notify the Engineer not less than 25 days and not more than 125 days before the anticipated start of an activity that will change the vertical or horizontal clearance available to public traffic, including shoulders.

If vertical clearance is temporarily reduced to 15.5 feet or less, place low clearance warning signs in accordance with the California MUTCD and as ordered. Signs must comply with the dimensions, color, and legend requirements of the California MUTCD and these specifications except that the signs must have black letters and numbers on an orange retroreflective background. W12-2P signs must be illuminated so that the signs are clearly visible.

Pave or provide full width continuous and cleared wood walks for pedestrian openings through falsework. Protect pedestrians from falling objects and curing water for concrete. Extend overhead protection for pedestrians not less than 4 feet beyond the edge of the bridge deck. Illuminate all pedestrian openings through falsework. Temporary pedestrian facilities must comply with the American with Disabilities Act of 1990 (ADA).

Do not store vehicles, material, or equipment in a way that:

1. Creates a hazard to the public
2. Obstructs traffic control devices

Do not install or place temporary facilities used to perform the work which interfere with the free and safe passage of public traffic.

Temporary facilities which could be a hazard to public safety if improperly designed shall comply with design requirements specified in the contract for those facilities or, if none are specified, with standard design criteria or codes appropriate for the facility involved. Working drawings and design calculations for the temporary facilities shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California and shall be submitted to the Engineer for approval pursuant to Section 5-1.02, "Plans and Working Drawings." The

submittals shall designate thereon the standard design criteria or codes used. Installation of the temporary facilities shall not start until the Engineer has reviewed and approved the drawings.

If you appear to be neglectful or negligent in furnishing warning devices and taking protective measures, the Engineer may direct your attention to the existence of a hazard and the necessary warning devices must be furnished and installed and protective measures taken by you. If the Engineer points out the inadequacy of warning devices and protective measures, that action on the part of the Engineer does not relieve you from your responsibility for public safety or abrogate the obligation to furnish and pay for these devices and measures.

Install temporary railing (Type K) or other approved protection system under the following conditions:

1. Excavations: Where the near edge of the excavation is within 15 feet from the edge of an open traffic lane
2. Temporarily Unprotected Permanent Obstacles: When the work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and you elect to install the obstacle before installing the protective system; or you, for your convenience and as authorized, remove a portion of an existing protective railing at an obstacle and do not replace such railing completely the same day
3. Storage Areas: When material or equipment is stored within 15 feet of the edge of an open traffic lane and the storage is not otherwise prohibited by the provisions of these Standard Specifications and the special provisions
4. Height Differentials: When construction operations create a height differential greater than 0.15 feet within 15 feet of the edge of traffic lane

Temporary railing (Type K) does not need to be installed where excavations within 15 feet from edge of an open traffic lane are:

1. Covered with steel plates or concrete covers of adequate thickness to prevent accidental entry by traffic or the public
2. In side slopes, where the downhill slope is 4:1 (horizontal:vertical) or less unless a naturally occurring condition
3. Protected by existing barrier or railing

Offset the approach end of temporary railing (Type K) a minimum of 15 feet from the edge of an open traffic lane. Install the temporary railing on a skew toward the edge of the traffic lane of not more than one foot transversely to 10 feet longitudinally with respect to the edge of the traffic lane. If the 15-foot minimum offset cannot be achieved, the temporary railing must be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules must be installed at the approach end of the temporary railing.

Secure in place temporary railing (Type K) before starting work for which the temporary railing is required.

Where 2 or more lanes in the same direction are adjacent to the area where the work is being performed, including shoulders, the adjacent lane must be closed under any of the following conditions:

1. Work is off the traveled way but within 6 feet of the edge of traveled way, and approach speed is greater than 45 miles per hour
2. Work is off the traveled way but within 3 feet of the edge of traveled way, and approach speed is less than 45 miles per hour

Closure of the adjacent traffic lane is not required when:

1. Performing work behind a barrier
2. Paving, grinding, or grooving
3. Installing, maintaining, or removing traffic control devices except temporary railing (Type K)

Do not reduce an open traffic lane width to less than 10 feet. When traffic cones or delineators are used for temporary edge delineation, the line of cones or delineators is considered the edge of the traveled way.

If a traffic lane is closed with channelizers for excavation work, move the devices to the adjacent edge of the traveled way when not excavating. Space the devices the same as specified for the lane closure.

Do not move or temporarily suspend anything over a traffic lane open to the public unless the public is protected.

Replace Section 7-1.11 with:

7-1.11 PRESERVATION OF PROPERTY

Comply with Section 5-1.18, "Property and Facility Preservation."

Replace Section 7-1.12 with:

7-1.12 INDEMNIFICATION AND INSURANCE

The Contractor's obligations regarding indemnification of the State of California and the requirements for insurance shall conform to the provisions in Section 3-1.05, "Insurance Policies," and Sections 7-1.12A, "Indemnification," and 7-1.12B, "Insurance," of this Section 7-1.12.

7-1.12A Indemnification

The Contractor shall defend, indemnify, and save harmless the State, including its officers, employees, and agents (excluding agents who are design professionals) from any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, losses or liabilities, in law or in equity (Section 7-1.12A Claims) arising out of or in connection with the Contractor's performance of this contract for:

1. Bodily injury including, but not limited to, bodily injury, sickness or disease, emotional injury or death to persons, including, but not limited to, the public, any employees or agents of the Contractor, the State, or any other contractor; and
2. Damage to property of anyone including loss of use thereof; caused or alleged to be caused in whole or in part by any negligent or otherwise legally actionable act or omission of the Contractor or anyone directly or indirectly employed by the Contractor or anyone for whose acts the Contractor may be liable.

Except as otherwise provided by law, these requirements apply regardless of the existence or degree of fault of the State. The Contractor is not obligated to indemnify the State for Claims arising from conduct delineated in Civil Code Section 2782 and to Claims arising from any defective or substandard condition of the highway that existed at or before the start of work, unless this condition has been changed by the work or the scope of the work requires the Contractor to maintain existing highway facilities and the Claim arises from the Contractor's failure to maintain. The Contractor's defense and indemnity obligation shall extend to Claims arising after the work is completed and accepted if the Claims are directly related to alleged acts or omissions by the Contractor that occurred during the course of the work. State inspection is not a waiver of full compliance with these requirements.

The Contractor's obligation to defend and indemnify shall not be excused because of the Contractor's inability to evaluate liability or because the Contractor evaluates liability and determine that the Contractor is not liable. The Contractor shall respond within 30 days to the tender of any Claim for defense and indemnity by the State, unless this time has been extended by the State. If the Contractor fails to accept or reject a tender of defense and indemnity within 30 days, in addition to any other remedy authorized by law, the Department may withhold such funds the State reasonably considers necessary for its defense and indemnity until disposition has been made of the Claim or until the Contractor accepts or rejects the tender of defense, whichever occurs first.

With respect to third-party claims against the Contractor, the Contractor waives all rights of any type to express or implied indemnity against the State, its officers, employees, or agents (excluding agents who are design professionals).

Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these indemnification specifications.

7-1.12B Insurance

7-1.12B(1) General

Nothing in the contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

7-1.12B(2) Casualty Insurance

The Contractor shall procure and maintain insurance on all of its operations with companies acceptable to the State as follows:

1. The Contractor shall keep all insurance in full force and effect from the beginning of the work through contract acceptance.

2. All insurance shall be with an insurance company with a rating from A.M. Best Financial Strength Rating of A- or better and a Financial Size Category of VII or better.
3. The Contractor shall maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Code of Civil Procedure Section 337.15.

7-1.12B(3) Workers' Compensation and Employer's Liability Insurance

In accordance with Labor Code Section 1860, the Contractor shall secure the payment of worker's compensation in accordance with Labor Code Section 3700.

In accordance with Labor Code Section 1861, the Contractor shall submit to the Department the following certification before performing the work:

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

Contract execution constitutes certification submittal.

The Contractor shall provide Employer's Liability Insurance in amounts not less than:

1. $1,000,000 for each accident for bodily injury by accident
2. $1,000,000 policy limit for bodily injury by disease
3. $1,000,000 for each employee for bodily injury by disease

If there is an exposure of injury to the Contractor's employees under the U.S. Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage shall be included for such injuries or claims.

7-1.12B(4) Liability Insurance

7-1.12B(4)(a) General

The Contractor shall carry General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of the Contractor providing insurance for bodily injury liability and property damage liability for the following limits and including coverage for:

1. Premises, operations, and mobile equipment
2. Products and completed operations
3. Broad form property damage (including completed operations)
4. Explosion, collapse, and underground hazards
5. Personal injury
6. Contractual liability

7-1.12B(4)(b) Liability Limits/Additional Insureds

The limits of liability shall be at least the amounts shown in the following table:

Total Bid	For Each Occurrence[1]	Aggregate for Products/Completed Operation	General Aggregate[2]	Umbrella or Excess Liability[3]
≤$1,000,000	$1,000,000	$2,000,000	$2,000,000	$5,000,000
>$1,000,000 ≤$10,000,000	$1,000,000	$2,000,000	$2,000,000	$10,000,000
>$10,000,000 ≤$25,000,000	$2,000,000	$2,000,000	$4,000,000	$15,000,000
>$25,000,000	$2,000,000	$2,000,000	$4,000,000	$25,000,000

1. Combined single limit for bodily injury and property damage.
2. This limit shall apply separately to the Contractor's work under this contract.
3. The umbrella or excess policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.

The Contractor shall not require certified Small Business subcontractors to carry Liability Insurance that exceeds the limits in the table above. Notwithstanding the limits specified herein, at the option of the Contractor, the liability insurance limits for certified Small Business subcontractors of any tier may be less than those limits specified in the table. For Small Business subcontracts, "Total Bid" shall be interpreted as the amount of subcontracted work to a certified Small Business.

The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, shall be named as additional insureds under the General Liability and Umbrella Liability Policies with respect to liability arising out of or connected with work or operations performed by or on behalf of the Contractor under this contract. Coverage for such additional insureds does not extend to liability:

1. Arising from any defective or substandard condition of the roadway which existed at or before the time the Contractor started work, unless such condition has been changed by the work or the scope of the work requires the Contractor to maintain existing roadway facilities and the claim arises from the Contractor's failure to maintain;
2. For claims occurring after the work is completed and accepted unless these claims are directly related to alleged acts or omissions of the Contractor that occurred during the course of the work; or
3. To the extent prohibited by Insurance Code Section 11580.04

Additional insured coverage shall be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured (Form B) endorsement form CG 2010, as published by the Insurance Services Office (ISO), or other form designated by the Department.

7-1.12B(4)(c) Contractor's Insurance Policy is Primary

The policy shall stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and shall not be called upon to contribute with this insurance.

7-1.12B(5) Automobile Liability Insurance

The Contractor shall carry automobile liability insurance, including coverage for all owned, hired, and nonowned automobiles. The primary limits of liability shall be not less than $1,000,000 combined single limit each accident for bodily injury and property damage. The umbrella or excess liability coverage required under Section 7-1.12B(4)(b) also applies to automobile liability.

7-1.12B(6) Policy Forms, Endorsements, and Certificates

The Contractor shall provide its General Liability Insurance under Commercial General Liability policy form No. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form No. CG0001.

7-1.12B(7) Deductibles

The State may expressly allow deductible clauses, which it does not consider excessive, overly broad, or harmful to the interests of the State. Regardless of the allowance of exclusions or deductions by the State, the Contractor is responsible for any deductible amount and shall warrant that the coverage provided to the State is in accordance with Section 7-1.12B, "Insurance."

7-1.12B(8) Enforcement

The Department may assure the Contractor's compliance with its insurance obligations. Ten days before an insurance policy lapses or is canceled during the contract period, the Contractor shall submit to the Department evidence of renewal or replacement of the policy.

If the Contractor fails to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to the Contractor or terminate the Contractor's control of the work in accordance with Section 8-1.08, "Termination of Control."

The Contractor is not relieved of its duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

Minimum insurance coverage amounts do not relieve the Contractor for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this contract.

7-1.12B(9) Self-Insurance

Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

If the Contractor uses a self-insurance program or self-insured retention, the Contractor shall provide the State with the same protection from liability and defense of suits as would be afforded by first-dollar insurance. Execution of the contract is the Contractor's acknowledgement that the Contractor will be bound by all laws as if the Contractor were an insurer as defined under Insurance Code Section 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Insurance Code Section 22.

Replace Section 7-1.125 with:

7-1.125 Legal Actions Against the Department

If legal action is brought against the Department over compliance with a State or Federal law, rule, or regulation applicable to highway work, then:

1. If the Department, in complying with a court order, prohibits you from performing work, the resulting delay is a suspension related to your performance, unless the Department terminates the contract.
2. If a court order other than an order to show cause or the final judgment in the action prohibits the Department from requiring you to perform work, the Department may delete the prohibited work or terminate the contract.

In Section 7-1.13 delete the 5th and 6th paragraphs.

Add:

7-1.50 FEDERAL LAWS FOR FEDERAL-AID CONTRACTS

7-1.50A General

Section 7-1.50, "Federal Laws for Federal-Aid Contracts," includes specifications required in a Federal-aid construction contract and applies to a Federal-aid contract.

A copy of form FHWA-1273 is included in Section 7-1.50B, "FHWA-1273." The training and promotion section of section II refers to training provisions as if they were included in the special provisions. The Department specifies the provisions in section 7-1.11D of the Standard Specifications. If a number of trainees or apprentices is required, the Department specifies the number in the special provisions. Interpret each FHWA-1273 clause shown in the following table as having the same meaning as the corresponding Department clause:

FHWA-1273 Nondiscrimination Clauses

FHWA-1273 section	FHWA-1273 clause	Department clause
Training and Promotion	In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.	If section 7-1.11D applies, section 7-1.11D supersedes this subparagraph.
Records and Reports	If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.	If the Contract requires on-the-job training, collect and report training data.

7-1.50B FHWA-1273

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. General
II. Nondiscrimination
III. Nonsegregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Compliance with Governmentwide Suspension and Debarment Requirements
XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under

this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are

applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor

will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or

will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;
(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. **Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. **Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the

department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

7-1.50C Female and Minority Goals

To comply with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-Aid Construction Contracts," the Department is including in Section 7-1.50C, "Female and Minority Goals," female and minority utilization goals for Federal-aid construction contracts and subcontracts that exceed $10,000.

The nationwide goal for female utilization is 6.9 percent.

The goals for minority utilization [45 Fed Reg 65984 (10/3/1980)] are as follows:

Minority Utilization Goals

Economic Area		Goal (Percent)
174	Redding CA: Non-SMSA Counties: CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehema	6.8
175	Eureka, CA Non-SMSA Counties: CA Del Norte; CA Humboldt; CA Trinity	6.6
176	San Francisco-Oakland-San Jose, CA: SMSA Counties: 7120 Salinas-Seaside-Monterey, CA CA Monterey 7360 San Francisco-Oakland CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo 7400 San Jose, CA CA Santa Clara, CA 7485 Santa Cruz, CA CA Santa Cruz 7500 Santa Rosa CA Sonoma 8720 Vallejo-Fairfield-Napa, CA CA Napa; CA Solano Non-SMSA Counties: CA Lake; CA Mendocino; CA San Benito	 28.9 25.6 19.6 14.9 9.1 17.1 23.2
177	Sacramento, CA: SMSA Counties: 6920 Sacramento, CA CA Placer; CA Sacramento; CA Yolo Non-SMSA Counties CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba	 16.1 14.3
178	Stockton-Modesto, CA: SMSA Counties: 5170 Modesto, CA CA Stanislaus 8120 Stockton, CA CA San Joaquin Non-SMSA Counties CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Toulumne	 12.3 24.3 19.8
179	Fresno-Bakersfield, CA SMSA Counties: 0680 Bakersfield, CA CA Kern 2840 Fresno, CA CA Fresno Non-SMSA Counties: CA Kings; CA Madera; CA Tulare	 19.1 26.1 23.6
180	Los Angeles, CA: SMSA Counties:	

	0360 Anaheim-Santa Ana-Garden Grove, CA CA Orange 4480 Los Angeles-Long Beach, CA CA Los Angeles 6000 Oxnard-Simi Valley-Ventura, CA CA Ventura 6780 Riverside-San Bernardino-Ontario, CA CA Riverside; CA San Bernardino 7480 Santa Barbara-Santa Maria-Lompoc, CA CA Santa Barbara Non-SMSA Counties CA Inyo; CA Mono; CA San Luis Obispo	11.9 28.3 21.5 19.0 19.7 24.6
181	San Diego, CA: SMSA Counties 7320 San Diego, CA CA San Diego Non-SMSA Counties CA Imperial	 16.9 18.2

For each July during which work is performed under the contract, you and each non-material-supplier subcontractor with a subcontract of $10,000 or more must complete Form FHWA PR-1391 (Appendix C to 23 CFR 230). Submit the forms by August 15.

7-1.50D Training

Section 7-1.50D, "Training," applies if a number of trainees or apprentices is specified in the special provisions.

As part of your equal opportunity affirmative action program, provide on-the-job training to develop full journeymen in the types of trades or job classifications involved.

You have primary responsibility for meeting this training requirement.

If you subcontract a contract part, determine how many trainees or apprentices are to be trained by the subcontractor.

Include these training requirements in your subcontract.

Where feasible, 25 percent of apprentices or trainees in each occupation must be in their 1st year of apprenticeship or training.

Distribute the number of apprentices or trainees among the work classifications on the basis of your needs and the availability of journeymen in the various classifications within a reasonable recruitment area.

Before starting work, submit to the Department:

1. Number of apprentices or trainees to be trained for each classification
2. Training program to be used
3. Training starting date for each classification

Obtain the Department's approval for this submitted information before you start work. The Department credits you for each apprentice or trainee you employ on the work who is currently enrolled or becomes enrolled in an approved program.

The primary objective of Section 7-1.50D, "Training," is to train and upgrade minorities and women toward journeymen status. Make every effort to enroll minority and women apprentices or trainees, such as conducting systematic and direct recruitment through public and private sources likely to yield minority and women apprentices or trainees, to the extent they are available within a reasonable recruitment area. Show that you have made the efforts. In making these efforts, do not discriminate against any applicant for training.

Do not employ as an apprentice or trainee an employee:

1. In any classification in which the employee has successfully completed a training course leading to journeyman status or in which the employee has been employed as a journeyman
2. Who is not registered in a program approved by the US Department of Labor, Bureau of Apprenticeship and Training

Ask the employee if the employee has successfully completed a training course leading to journeyman status or has been employed as a journeyman. Your records must show the employee's answers to the questions.

In your training program, establish the minimum length and training type for each classification. The Department and FHWA approves a program if one of the following is met:

1. It is calculated to:

    1.1. Meet the your equal employment opportunity responsibilities
    1.2. Qualify the average apprentice or trainee for journeyman status in the classification involved by the end of the training period

2. It is registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training and it is administered in a way consistent with the equal employment responsibilities of federal-aid highway construction contracts

Obtain the State's approval for your training program before you start work involving the classification covered by the program.

Provide training in the construction crafts, not in clerk-typist or secretarial-type positions. Training is allowed in lower level management positions such as office engineers, estimators, and timekeepers if the training is oriented toward construction applications. Training is allowed in the laborer classification if significant and meaningful training is provided and approved by the division office. Off-site training is allowed if the training is an integral part of an approved training program and does not make up a significant part of the overall training.

The Department reimburses you 80 cents per hour of training given an employee on this contract under an approved training program:

1. For on-site training
2. For off-site training if the apprentice or trainee is currently employed on a federal-aid project and you do at least one of the following:

    2.1. Contribute to the cost of the training
    2.2. Provide the instruction to the apprentice or trainee
    2.3. Pay the apprentice's or trainee's wages during the off-site training period

3. If you comply with Section 7-1.50D, "Training"

Each apprentice or trainee must:

1. Begin training on the project as soon as feasible after the start of work involving the apprentice's or trainee's skill
2. Remain on the project as long as training opportunities exist in the apprentice's or trainee's work classification or until the apprentice or trainee has completed the training program

Furnish the apprentice or trainee:

1. Copy of the program you will comply with in providing the training
2. Certification showing the type and length of training satisfactorily completed

Maintain records and submit reports documenting your performance under Section 7-1.50D, "Training."

^^

SECTION 8 PROSECUTION AND PROGRESS
(Issued 06-05-09)

Replace Section 8 with:

SECTION 8 PROSECUTION AND PROGRESS

8-1.01 (BLANK)

8-1.02 ASSIGNMENT

No third-party agreement relieves you or your surety of your responsibility to complete the work. Do not sell, transfer, or otherwise dispose of any contract part without prior written consent from the Department.

If you assign the right to receive contract payments, the Department accepts the assignment upon the Engineer's receipt of a notice. Assigned payments remain subject to deductions and withholds described in the contract. The Department may use withheld payments for work completion whether payments are assigned or not.

8-1.025 PRECONSTRUCTION CONFERENCE

Attend a preconstruction conference with key personnel, including your assigned representative, at a time and location determined by the Engineer. Submit documents as required before the preconstruction conference. You may begin work before the preconstruction conference.

Be prepared to discuss the following topics and documents:

Topics	Document
Potential claim and dispute resolution	Potential claim forms
Contractor's representation	Assignment of Contractor's representative
DBE and DVBE	Final utilization reports
Equipment	Equipment list
Labor compliance and equal employment opportunity	Job site posters and benefit and payroll reports
Material inspection	Notice of Materials to be Used
Materials on hand	Request for Payment for Materials on Hand
Measurements	--
Partnering	Field Guide to Partnering on Caltrans Construction Projects
Quality control	QC plans
Safety	Injury and Illness Prevention Program and job site posters
Schedule	Baseline schedule and Weekly Statement of Working Days
Subcontracting	Subcontracting Request
Surveying	Survey Request
Traffic control	Traffic contingency plan and traffic control plans
Utility work	--
Weight limitations	--
Water pollution control	SWPPP or WPCP
Work restrictions	PLACs
Working drawings	--

8-1.03 BEGINNING OF WORK

Begin work within 15 days after receiving notice that the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department. Submit a written notice 72 hours before beginning work. If the project has more than one location of work, submit a separate notice for each location.

You may begin work before receiving the notice of contract approval if you:

1. Deliver the signed contract, bonds, and evidence of insurance to the Department
2. Submit 72-hour notice
3. Obtain an encroachment permit from the Department
4. Are authorized by the Department to begin
5. Perform work at your own risk
6. Perform work under the contract

The Engineer does not count working days for days worked before contract approval.

If the contract is approved, work already performed that complies with the contract is authorized.

If the contract does not get approved, leave the job site in a neat condition. If a facility has been changed, restore it to its former or equivalent condition at your expense.

The Department does not adjust time for beginning before the approval date.

8-1.04 PROGRESS SCHEDULE

8-1.04A General

Reserved

8-1.04B Critical Path Method Schedule

The following definitions apply to critical path method schedules:

activity: Task, event, or other project element on a schedule that contributes to completing the project. Activities have a description, start date, finish date, duration, and one or more logic ties.
baseline schedule: The initial schedule showing the original work plan beginning on the date of contract approval. This schedule shows no completed work to date and no negative float or negative lag to any activity.
controlling activity: Construction activity that extends the scheduled completion date if delayed.
critical path: Longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path extends the scheduled completion date.
critical path method (CPM): Network based planning technique using activity durations and relationships between activities to calculate a schedule for the entire project.
revised schedule: Schedule that incorporates a proposed or past change to logic or activity durations.
scheduled completion date: Planned project completion date shown on the current schedule.
updated schedule: Current schedule developed from the accepted baseline and any subsequent accepted updated or revised schedules through regular monthly review to incorporate actual past progress.

Before or at the preconstruction conference, submit a CPM baseline schedule.

Submit a monthly updated schedule that includes the status of work completed to date and the work yet to be performed as planned.

On each schedule, show:

1. Planned and actual start and completion date of each work activity, including applicable:

    1.1. Submittal development
    1.2. Submittal review and approval
    1.3. Material procurement
    1.4. Contract milestones and constraints
    1.5. Equipment and plant setup
    1.6. Interfaces with outside entities
    1.7. Erection and removal of falsework and shoring
    1.8. Test periods
    1.9. Major traffic stage change
    1.10. Final cleanup

2. Order that you propose to prosecute the work
3. Logical links between the time-scaled work activities
4. All controlling activities
5. Legible description of each activity
6. At least one predecessor and one successor to each activity, except for project start and project end milestones
7. Duration of not less than one working day for each activity
8. Start milestone date as the contract approval date

You may include changes on updated schedules that do not alter the critical path or extend the schedule completion date compared to the current schedule. Changes may include:

1. Adding or deleting activities
2. Changing activity constraints
3. Changing durations
4. Changing logic

If any proposed change in planned work results in altering the critical path or extending the scheduled completion date, submit a revised schedule within 15 days of the proposed change.

For each schedule submittal:

1. Submit a plotted original, time-scaled network diagram on a sheet of at least 8.5" x 11" with a title block and timeline
2. If a computer program is used to make the schedule, submit a read-only compact disc or diskette containing the schedule data. Label the compact disc or diskette with:

    2.1. Contract number
    2.2. CPM schedule number and date produced
    2.3. File name

If there is no contract item for progress schedule (critical path method), full compensation for this work is included in the contract prices paid for the items of work involved, and no additional compensation will be allowed therefor.

8-1.05 TEMPORARY SUSPENSION OF WORK

8-1.05A General

The Engineer may suspend work wholly or in part due to any of the following:

1. Conditions are unsuitable for work progress.
2. You fail to do any of the following:

    2.1. Fulfill the Engineer's orders.
    2.2. Fulfill a contract part.
    2.3. Perform weather-dependent work when conditions are favorable so that weather-related unsuitable conditions are avoided or do not occur.

Upon the Engineer's written order of suspension, suspend work immediately. Provide for public safety and a smooth and unobstructed passageway through the work zone during the suspension as specified in Sections 7-1.08, "Public Convenience," and 7-1.09, "Public Safety." Resume work when ordered.

8-1.05B Suspensions Unrelated to Contractor Performance

For a suspension unrelated to your performance, providing for a smooth and unobstructed passageway through the work during the suspension will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

The days during a suspension unrelated to your performance are non-working days.

8-1.05C Suspensions Related to Contractor Performance

For a suspension related to your performance, the Department may provide for a smooth and unobstructed passageway through the work during the suspension and deduct the cost from payments.

The days during a suspension related to your performance are working days.

8-1.06 TIME OF COMPLETION

The time to complete the work is specified in the special provisions.

The Engineer issues a Weekly Statement of Working Days by the end of the following week unless the contract is suspended for reasons unrelated to your performance.

The Weekly Statement of Working Days shows:

1. Working days and non–working days during the reporting week
2. Time adjustments
3. Work completion date computations, including working days remaining
4. Controlling activities

You may protest a Weekly Statement of Working Days.

8-1.07 LIQUIDATED DAMAGES

8-1.07A General

The Department specifies liquidated damages (Pub Cont Code § 10226). Liquidated damages, if any, accrue starting on the 1st day after the expiration of the working days through the day of contract acceptance except as specified in Sections 8-1.07B, "Failure to Complete Work Parts within Specified Times," and 8-1.07C, "Failure to Complete Work Parts by Specified Dates."

The Department withholds liquidated damages before the accrual date if the anticipated liquidated damages may exceed the value of the remaining work.

Liquidated damages for all work, except plant establishment, are:

Liquidated Damages		
Total Bid		Liquidated Damages per Day
From over	To	
$0	$50,000	$1,200
$50,000	$120,000	$1,500
$120,000	$1,000,000	$1,900
$1,000,000	$5,000,000	$3,000
$5,000,000	$10,000,000	$5,400
$10,000,000	$30,000,000	$8,300
$30,000,000	$100,000,000	$10,500
$100,000,000	$250,000,000	$28,500

If all work, except plant establishment, is complete and the total number of working days has expired, liquidated damages are $950 per day.

8-1.07B Failure to Complete Work Parts within Specified Times

The Department may deduct specified damages from payments for each day in completing a work part beyond the time specified for completing the work part.

Damages for untimely completion of work parts may not be equal to the daily amount specified as liquidated damages for the project as a whole, but the Department does not simultaneously assess damages for untimely completion of work parts and for the whole work.

Damages accrue starting the 1st day after a work part exceeds the specified time through the day the specified work part is complete.

8-1.07C Failure to Complete Work Parts by Specified Dates

The Department may deduct specified damages from payments for each day in completing a work part beyond the specified completion date for the work part.

Damages for untimely work part completion may not be equal to the daily amount specified as liquidated damages for the project as a whole, but the Department does not simultaneously assess damages for untimely work part completion and the whole work.

Damages accrue starting the 1st day after an unmet completion date through the day the work part is complete.

8-1.07D Director Days

If the work is not completed within the working days, the Director may grant director days if it serves the State's best interest.

By granting director days, the Director adds working days to the contract. The Director may either grant enough days to eliminate the liquidated damages or fewer. In the latter case, the Department deducts liquidated damages for the remaining overrun in contract time. The Director may deduct the Department's engineering, inspection, and overhead costs incurred during the period of extension granted as director days.

8-1.08 TERMINATION OF CONTROL

The Department may terminate your control of the work for failure to do any of the following (Pub Cont Code § 10253):

1. Supply an adequate workforce
2. Supply material as described
3. Pay subcontractors (Pub Cont Code §10262)

4. Prosecute the work as described in the contract

The Department may also terminate your control for failure to maintain insurance coverage.

For a Federal-aid contract, the Department may terminate your control of the work for failure to include "Required Contract Provisions, Federal-Aid Construction Contracts" in subcontracts.

The Department gives you and your surety notice at least 5 days before terminating control. The notice describes the failures and the time allowed to remedy the failures. If failures are not remedied within the time provided, the Department takes control of the work.

The Department may complete the work if the Department terminates your control or you abandon the project (Pub Cont Code § 10255). The Department determines the unpaid balance under Pub Cont Code § 10258 and the contract.

At any time before final payment of all claims, the Department may convert a termination of control to a termination of contract.

8-1.09 DELAYS

8-1.09A General

An excusable delay is a delay of a controlling activity beyond your control, not foreseeable when the work began such as:

1. Change in the work
2. Department action that is not part of the contract
3. Presence of an underground utility main not described in the contract or in a location different from that specified
4. Described facility reconstruction not reconstructed as described, by the utility owner by the date specified, unless the reconstruction is solely for your convenience
5. Department's failure to obtain timely access to the right-of-way
6. Department's failure to perform an action in the time specified

A critical delay is a delay that extends the schedule completion date.

To request a delay-related time or payment adjustment, submit an RFI.

8-1.09B Time Adjustments

For an excusable critical delay, the Department may make a time adjustment. The Engineer uses information from the schedule to evaluate requests for time adjustments.

If requesting an adjustment, submit a revised schedule showing the delay's effect on the controlling activity. If the delay has:

1. Occurred, submit records of dates and what work was performed during the delayed activity
2. Not occurred, submit the expected dates or duration of the delayed activity

If the Engineer requests, update the schedule to the last working day before the start of the delay.

8-1.09C Payment Adjustments

The Department may make a payment adjustment for an excusable delay that affects your costs.

Only losses for idle equipment, idle workers, and equipment moving or transporting are eligible for delay-related payment adjustments.

The Engineer determines payment for idle time of equipment in the same manner as determinations are made for equipment used in the performance of force account work under Section 9-1.03, "Force Account," with the following exceptions:

1. Delay factor in the Labor Surcharge and Equipment Rental Rates applies to each equipment rental rate.
2. Daily number of payable hours equals the normal working hours during the delay, not to exceed 8 hours per day.
3. Delay days exclude non–working days.
4. Markups are not added.

The Engineer determines payment adjustment for idle workers under Section 9-1.03B, "Labor," but does not add markups.

The Engineer includes costs due to necessary extra equipment moving or transporting.

8-1.10 (BLANK)

8-1.11 TERMINATION OF CONTRACT

8-1.11A General

The Director may terminate the contract if it serves the State's best interest. The Department issues you a written notice, implements the termination, and pays you.

8-1.11B Relief from Responsibility for Work

On receiving a termination notice:

1. Stop work
2. Notify subcontractors and suppliers of the contract termination and stop contract-related work
3. Perform the Engineer-ordered work to secure the job site for termination
4. Remove equipment
5. If authorized, settle termination-related claims and liabilities involving subcontractors and suppliers; assign to the Department the rights, titles, or interests held by you with respect to these parties

8-1.11C Responsibility for Materials

On receiving a termination notice, protect unused material until:

1. You submit an inventory of materials already produced, purchased, or ordered but not yet used; include the location of the material.
2. The Engineer identifies materials that will be retained by the Department. Submit bills of sales or other records of material title.
3. The Engineer confirms that unused materials paid by progress payment and materials furnished by the State have been delivered and stored as ordered.
4. Titles are transferred for materials purchased by the Department.

Dispose of materials that will not be retained by the Department.

8-1.11D Contract Acceptance after Termination

The Engineer recommends contract acceptance after determining completion of:

1. Contract work ordered to be completed before termination
2. Other work ordered to secure the project before termination
3. Material delivery and title transfer

The Department pays you under Section 9-1.08, "Payment After Contract Acceptance."

8-1.11E Payment Adjustment for Termination

If the Department issues a termination notice, the Engineer determines payment for termination based on the following:

1. Direct cost for the work:

    1.1. Including mobilization, demobilization, securing the job site for termination, and losses from the sale of materials

    1.2. Not including the cost of materials you keep, profit realized from the sale of materials, the cost of material damaged by an occurrence as defined in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," and other credits.

2. Cost of remedial work, as estimated by the Engineer, is not reimbursed.
3. Allowance for profit not to exceed 4 percent of the cost of the work. Prove a likelihood of having made a profit had the contract not been terminated.
4. Material handling costs for material returned to the vendor or disposed of as ordered.

5. Costs in determining the payment adjustment due to the termination, excluding attorney fees and litigation costs.

Termination of the contract does not relieve the surety of its obligation for any just claims arising out of the work performed.

^^

SECTION 9 MEASUREMENT AND PAYMENT
(Issued 03-11-10)

Replace Section 9 with:

SECTION 9 MEASUREMENT AND PAYMENT

9-1.01 MEASUREMENT OF QUANTITIES

9-1.01A General

The Department determines bid item quantities under U.S. customary units.

9-1.01B Weighing Equipment and Procedures

9-1.01B(1) General

The Engineer measures material quantities for payment with devices that comply with:

1. 4 CA Code of Regs § 4000 et seq.
2. Bus & Prof Code § 12001 et seq.

To determine the material payment quantities, use measuring devices that have been sealed by the Department of Food and Agriculture's Division of Measurement Standards or its designated representative.

If a device is not type approved by the Division of Measurement Standards, type approve it under California Test 109.

Notify the Engineer at least 1 business day in advance of equipment testing.

Use material plant controllers having elements affecting the data accuracy and delivery that have been sealed by the Engineer. Make these elements available to the Engineer for inspection. If the elements are adequate for use, the Engineer seals them. If security seal manipulation occurs, stop material production. Do not resume production until the Engineer reinspects and reseals the device.

The Engineer measures material paid for by weight on Contractor-furnished sealed scales regularly inspected by the Department of Food and Agriculture's Division of Measurement Standards or its designated representative.

Obtain authorization of portable vehicle scale installations before sealing.

Proportioning scales must comply with Section 5-1.10, "Equipment."

9-1.01B(2) Equipment

Each scale must be long enough to fit an entire vehicle or a combination vehicle on the scale deck. The Department allows you to weigh a combination vehicle separately if you disconnect the vehicles.

Construct scale undersupports:

1. Using portland cement concrete containing at least 470 pounds of cement per cubic yard produced from commercial quality materials
2. Such that footing heights are at least 20 inches thick
3. With a bearing surface at least 30 inches wide and bearing pressure on the footing not over 4000 pounds per square foot

In constructing a scale:

1. Furnish drainage to prevent water from saturating the ground under the scale
2. Use bulkheads that prevent displacement
3. If shimming is necessary:

3.1. Use securely attached metal shims or grout
3.2 Do not use wedges to shim the supports
3.3. Do not use shim material in excess of 3 inches

4. Install mechanical indicating elements level, plumb, and rigidly mounted on the concrete undersupports
5. For a hopper scale, rigidly attach hopper scale lever systems and mechanical indicating elements so no weight is lost from bending or support distortion

Each scale used to determine material payment quantities must be operated by a licensed weighmaster (Bus & Prof Code § 12700 et seq.).

Submit a public weighmaster's certificate or certified daily summary weigh sheets for each weighed material quantity. The Department may witness material weighing and check and compile the daily scale weight record.

Each vehicle operator must obtain weight or load slips from the weighmaster. Submit these records at the delivery point.

9-1.01B(3) Procedures

Daily, weigh empty vehicles used to haul material paid for by weight. Each vehicle must have a legible identification mark. The Department may verify material weight by having an empty and loaded vehicle weighed on any scale the Engineer designates.

For imported topsoil measured by volume, soil amendment, and mulch:

1. Each vehicle must allow a ready and accurate contents determination
2. Unless vehicles are of uniform capacity, each vehicle must have a legible identification mark showing its volume capacity
3. Load vehicles to at least the volume capacity
4. Level vehicle loads on arrival at the delivery point

If determining a quantity paid on a volume basis is impractical or if you request and the Engineer authorizes the request, the Engineer weighs the material and converts the result to a volume measurement. The Engineer determines the conversion factors and, if you agree, adopts this method of measurement.

9-1.01C Final Pay Items

The Department shows a bid item quantity as a final pay item for payment purposes only. For a final pay item, accept payment based on the verified Bid Item List quantity, regardless of actual quantity used unless dimensions are changed by the Engineer.

9-1.01D Quantities of Aggregate and Other Roadway Materials

The Engineer determines the weight of aggregate and other roadway materials that are being paid for by weight as shown and does not include the deducted weight of water in their payment quantities.

Material	Quantity Determination
Aggregate or other roadway material except as otherwise shown in this table	By deducting the weight of water in the material[a] in excess of 3 percent of the dry weight of the material from the weight of the material
Imported borrow, imported topsoil, aggregate subbase	By deducting the weight of water in the material[a] in excess of 6 percent of the dry weight of the material from the weight of the material
Straw	By deducting the weight of water in the material[a] in excess of 15 percent of the dry weight of the material from the weight of the material
Fiber[b]	Engineer does not deduct the weight of water
Aggregate base and aggregate for cement treated bases	As specified in Section 26, "Aggregate Bases," and Section 27, "Cement Treated Bases"

NOTE: Percentage of water is determined by California Test 226.
[a]At the time of weighing
[b]Weight of water in the fiber[a] must not exceed 15 percent of the dry weight of the fiber.

9-1.02 SCOPE OF PAYMENT

The Department pays you for furnishing the resources and activities required to complete the Contract work. The Department's payment is full compensation for furnishing the resources and activities, including:

1. Risk, loss, damage repair, or cost of whatever character arising from or relating to the work and performance of the work
2. PLACs and taxes

Full compensation for work specified in Sections 1 through 9 is included in the payment for the bid items involved unless:

1. Bid item for the work is shown on the verified Bid Item List
2. Work is specified as paid for as extra work

The Department does not pay for your loss, damage, repair, or extra costs of whatever character arising from or relating to the work that is a direct or indirect result of your choice of construction methods, materials, equipment, or manpower, unless specifically mandated by the Contract.

Payment is:

1. Full compensation for each bid item specified by the description and measurement unit shown on the verified Bid Item List
2. For the price bid for each bid item shown on the verified Bid Item List or as changed by change order with a specified price adjustment

If an alternative is described in the Contract, the Department pays based on the bid items for the details and specifications not described as an alternative.

The Department pays for work performed by change order based on one or a combination of the following:

1. Bid item prices
2. Force account
3. Agreed price
4. Specialist billing

If the Engineer chooses to pay for work performed by change order based on an agreed price, but you and the Engineer cannot agree on the price, the Department pays by force account.

If a portion of extra work is covered by bid items, the Department pays for this work as changed quantities in those items. The Department pays for the remaining portion of the extra work by force account or agreed price.

The Department pays 10 percent annual interest for unpaid and undisputed:

1. Progress payments
2. After-acceptance payment except for claims

For these payments, interest starts to accrue 30 days after the 1st working day following the 20th day of the month payment is due. For extra work bills not submitted within 7 days after performing the work as specified in 5-1.015E, "Extra Work Bills," interest starts to accrue 60 days after the 1st working day following the 20th day of the month payment is due.

The Department pays 6 percent annual interest for unpaid and undisputed claims. Interest starts to accrue 61 days after the Department accepts a claim statement.

The Department pays 6 percent annual interest for awards in arbitration (Civ Code § 3289).

If the amount of a deduction or withhold exceeds final payment, the Department invoices you for the difference, to be paid upon receipt.

9-1.03 FORCE ACCOUNT PAYMENT

9-1.03A General

For work paid by force account, the Engineer compares the Department's records to your daily force account work report. When you and the Engineer agree on the contents of the daily force account work reports, the Engineer accepts the report and the Department pays for the work. If the records differ, the Department pays for the work based only on the information shown on the Department's records.

If a subcontractor performs work at force account, accept an additional 10 percent markup to the total cost of that work paid at force account, including markups specified in Section 9-1.03, as reimbursement for additional administrative costs.

The markups specified in labor, materials, and equipment include compensation for all delay costs, overhead costs, and profit.

If an item's payment is adjusted for work-character changes, the Department excludes your cost of determining the adjustment.

Payment for owner-operated labor and equipment is made at the market-priced invoice submitted.

9-1.03B Labor

Labor payment is full compensation for the cost of labor used in the direct performance of the work plus a 35 percent markup. Force account labor payment consists of:

1. Employer payment to the worker for:

    1.1. Basic hourly wage
    1.2. Health and welfare
    1.3. Pension
    1.4. Vacation
    1.5. Training
    1.6. Other State and federal recognized fringe benefit payments

2. Labor surcharge percentage in Labor Surcharge and Equipment Rental Rates current during the work paid at force account for:

    2.1. Workers' compensation insurance
    2.2. Social security
    2.3. Medicare
    2.4. Federal unemployment insurance
    2.5. State unemployment insurance
    2.6. State training taxes

3. Subsistence and travel allowances paid to the workers
4. Employer payment to supervisors, if authorized

The 35 percent markup consists of payment for all overhead costs related to labor but not designated as costs of labor used in the direct performance of the work including:

1. Home office overhead
2. Field office overhead
3. Bond costs
4. Profit
5. Labor liability insurance
6. Other fixed or administrative costs that are not costs of labor used in the direct performance of the work

9-1.03C Materials

Material payment is full compensation for materials you furnish and use in the work. The Engineer determines the cost based on the material purchase price, including delivery charges, except:

1. A 15 percent markup is added.
2. Supplier discounts are subtracted whether you took them or not.
3. If the Engineer believes the material purchase prices are excessive, the Department pays the lowest current wholesale price for a similar material quantity.
4. If you procured the materials from a source you wholly or partially own, the determined cost is based on the lower of the:

    4.1. Price paid by the purchaser for similar materials from that source on Contract items
    4.2. Current wholesale price for those materials

5. If you do not submit a material cost record within 30 days of billing, the determined cost is based on the lowest wholesale price:

   5.1. During that period
   5.2. In the quantities used

9-1.03D Equipment Rental

9-1.03D(1) General

Equipment rental payment is full compensation for:

1. Rental equipment costs, including moving rental equipment to and from the site of work performed by change order using its own power.
2. Transport equipment costs for rental equipment that cannot be transported economically using its own power. No payment is made during transport for the transported equipment.
3. 15 percent markup.

If you want to return the equipment to a location other than its original location, the payment to move the equipment must not exceed the cost of returning the equipment to its original location. If you use the equipment for work other than work paid by force account, the transportation cost is included in the other work.

Before moving or loading the equipment, obtain authorization for the equipment rental's original location.

The Engineer determines rental costs:

1. Using rates in Labor Surcharge and Equipment Rental Rates:

   1.1. By classifying equipment using manufacturer's ratings and manufacturer-approved changes.
   1.2. Current during the work paid by force account.
   1.3. Regardless of equipment ownership; but the Department uses the rental document rates or minimum rental cost terms if:

      1.3.1. Rented from equipment business you do not own.
      1.3.2. The Labor Surcharge and Equipment Rental Rates hourly rate is $10.00 per hour or less.

2. Using rates established by the Engineer for equipment not listed in Labor Surcharge and Equipment Rental Rates. You may submit cost information that helps the Engineer establish the rental rate; but the Department uses the rental document rates or minimum rental cost terms if:

   2.1. Rented from equipment business you do not own.
   2.2. The Engineer establishes a rate of $10.00 per hour or less.

3. Using rates for transport equipment not exceeding the hourly rates charged by established haulers.

Equipment rental rates include the cost of:

1. Fuel
2. Oil
3. Lubrication
4. Supplies
5. Small tools that are not consumed by use
6. Necessary attachments
7. Repairs and maintenance
8. Depreciation
9. Storage
10. Insurance
11. Incidentals

The Department pays for small tools consumed by use. The Engineer determines payment for small tools consumed by use based on Contractor-submitted invoices.

9-1.03D(2) Equipment On the Job Site

For equipment on the job site at the time required to perform work paid by force account, the time paid is the time:

1. To move the equipment to the location of work paid by force account plus an equal amount of time to move the equipment to another location on the job site when the work paid by force account is completed
2. To load and unload equipment
3. Equipment is operated to perform work paid by force account and:

   3.1. Hourly rates are paid in 1/2-hour increments
   3.2 Daily rates are paid in 1/2-day increments

When rented equipment on the job site is used to perform work at force account not required by the original contract work, the Engineer may authorize rates in excess of those in Labor Surcharge and Equipment Rental Rates if:

1. You submit a request to use rented equipment
2. Equipment is not available from your owned equipment fleet or from your subcontractors
3. Rented equipment is from an independent rental company
4. Proposed equipment rental rate is reasonable
5. Engineer authorizes the equipment source and the rental rate before you use the equipment

The Department pays for fuel consumed during operation of rented equipment not included in the invoiced rental rate.

9-1.03D(3) Equipment Not On the Job Site Required for Original Contract Work

For equipment not on the job site at the time required to perform work paid by force account and required for original Contract work, the time paid is the time the equipment is operated to perform work paid by force account and the time to move the equipment to a location on the job site when the work paid by force account is completed.

The minimum total time paid is:

1. 1 day if daily rates are paid
2. 8 hours if hourly rates are paid

If daily rates are recorded, equipment:

1. Idled is paid as 1/2 day
2. Operated 4 hours or less is paid as 1/2 day
3. Operated 4 hours or more is paid as 1 day

If the minimum total time exceeds 8 hours and if hourly rates are listed, the Department rounds up hours operated to the nearest 1/2-hour increment and pays based on the following table. The table does not apply when equipment is not operated due to breakdowns; in which case rental hours are the hours the equipment was operated.

Equipment Rental Hours

Hours operated	Hours paid
0.0	4.00
0.5	4.25
1.0	4.50
1.5	4.75
2.0	5.00
2.5	5.25
3.0	5.50
3.5	5.75
4.0	6.00
4.5	6.25
5.0	6.50

5.5	6.75
6.0	7.00
6.5	7.25
7.0	7.5
7.5	7.75
>8.0	hours used

9-1.03D(4) Equipment Not On the Job Site Not Required for Original Contract Work

For equipment not on the job site at the time required to perform work paid by force account and not required for original Contract work, the time paid is the time:

1. To move the equipment to the location of work paid by force account plus an equal amount of time to return the equipment to its source when the work paid by force account is completed
2. To load and unload equipment
3. Equipment is operated to perform work paid by force account

For this equipment, the Engineer may authorize rates in excess of those in Labor Surcharge and Equipment Rental Rates subject to the following:

1. Equipment is not available from your normal sources or from one of your subcontractors
2. Proposed equipment rental rate is reasonable
3. Engineer authorizes the equipment source and the rental rate before you use the equipment

9-1.03D(5) Non-Owner-Operated Dump Truck Rental

Submit the rental rate for non-owner-operated dump truck rental. The Engineer determines the payment rate. Payment for non-owner-operated dump truck rental is for the cost of renting a dump truck, including its driver. For the purpose of markup payment only, the non-owner-operated dump truck is rental equipment and the owner is a subcontractor.

9-1.04 EXTRA WORK PERFORMED BY SPECIALISTS

If the Engineer determines that you or your subcontractors are not capable of performing specialty extra work, a specialist may be used. Itemize the labor, material, and equipment rental costs unless it is not the special service industry's established practice to provide itemization; in which case, the Engineer accepts current market-priced invoices for the work.

The Engineer may accept an invoice as a specialist billing for work performed at an off–job site manufacturing plant or machine shop.

The Engineer determines the cost based on the specialist invoice price minus any available or offered discounts plus a 10 percent markup.

9-1.05 CHANGED QUANTITY PAYMENT ADJUSTMENTS

9-1.05A General

The unit prices specified in Section 9-1.05 are adjusted under Section 9-1.03, "Force Account."

9-1.05B Increases of More Than 25 Percent

If the total bid item quantity exceeds 125 percent of the quantity shown on the verified Bid Item List and if no approved Contract Change Order addresses payment for the quantity exceeding 125 percent, the Engineer may adjust the unit price for the excess quantity under Section 9-1.03, "Force Account," or the following:

1. The adjustment is the difference between the unit price and the unit cost of the total item pay quantity.
2. In determining the unit cost, the Engineer excludes the item's fixed costs. You have recovered the fixed costs in the payment for 125 percent shown on the verified Bid Item List.
3. After excluding fixed costs, the Engineer determines the item unit cost under Section 9-1.03, "Force Account."

If the payment for the number of units of a bid item in excess of 125 percent of the verified Bid Item List is less than $5,000 at the unit price, the Engineer may not adjust the unit price unless you request it.

9-1.05C Decreases of More Than 25 Percent

If the total item pay quantity is less than 75 percent of the quantity shown on the verified Bid Item List and if no approved Contract Change Order addresses payment for the quantity less than 75 percent, you may request a unit price adjustment. The Engineer may adjust the unit price for the decreased quantity under Section 9-1.03, "Force Account" or the following:

1. The adjustment is the difference between the unit price and the unit cost of the total pay quantity.
2. In determining the unit cost, the Engineer includes the item's fixed costs.
3. After including fixed costs, the Engineer determines the item unit cost under Section 9-1.03, "Force Account."

The Department does not pay more than 75 percent of the item total in the verified Bid Item List.

9-1.05D Eliminated Items

If the Engineer eliminates an item, the Department pays your costs incurred before the Engineer's elimination notification date.

If you order authorized material for an eliminated item before the notification date and the order cannot be canceled, either of the following occurs:

1. If the material is returnable to the vendor, the Engineer orders you to return the material and the Department pays your handling costs and vendor charges.
2. The Department pays your cost for the material and its handling and becomes the material owner.

The Engineer determines the payment for the eliminated bid item under Section 9-1.03, "Force Account."

9-1.06 WORK-CHARACTER CHANGES

The Department adjusts a bid item unit price based on the difference between the cost to perform the work as planned and the cost to perform the work as changed. The Engineer determines the payment adjustment under Section 9-1.03, "Force Account." The Department adjusts payment for only the work portion that changed in character.

9-1.07 PROGRESS PAYMENTS

9-1.07A General

The Department pays you based on Engineer-prepared monthly progress estimates. Each estimate reflects:

1. Total work completed during the pay period
2. Extra work bills if:
   2.1. Submitted by the 15th of a month
   2.2. Approved by the 20th of a month
3. Amount for materials on hand
4. Amount earned for mobilization
5. Deductions
6. Withholds
7. Resolved potential claims
8. Payment adjustments

Submit certification stating the work complies with the QC procedures. The Engineer does not process a progress estimate without a signed certification.

You may protest a progress payment.

9-1.07B Schedule of Values

Section 9-1.07B applies to a lump sum bid item for which a schedule of values is specified to be submitted.

The sum of the amounts for the work units listed in the schedule of values must equal the lump sum price bid for the bid item.

Obtain authorization of a schedule of values before you perform work shown on the schedule. The Department does not process a progress payment for the bid item without an authorized schedule of values.

Accept progress payments for overhead, profit, bond costs, and other fixed or administrative costs as distributed proportionally among the items listed except that for a contract with a bid item for mobilization, accept progress payments for bond costs as included in the mobilization bid item.

For changed quantities of the work units listed, the Department adjusts payments in the same manner as specified for changed quantities of bid items under Section 9-1.05, "Changed Quantity Payment Adjustments."

9-1.07C Materials On Hand

A material on hand but not incorporated into the work is eligible for progress payment if:

1. Listed in a special provision as eligible and is in compliance with other Contract parts
2. Purchased
3. An invoice is submitted
4. Stored within the State and you submit evidence that the stored material is subject to the Department's control
5. Requested on the Department-furnished form

9-1.07D Mobilization

Mobilization is eligible for partial payments if the Contract includes a bid item for mobilization. The Department makes the partial payments under Pub Cont Code § 10264. If the Contract does not include a mobilization bid item, mobilization is included in the payment for the various bid items.

The Department pays the item total for mobilization in excess of 10 percent of the total bid in the 1st payment after Contract acceptance.

9-1.07E Withholds

9-1.07E(1) General

The Department may withhold payment for noncompliance.

The Department returns the noncompliance withhold in the progress payment following correction of noncompliance.

Withholds are not retentions under Pub Cont Code § 7107 and do not accrue interest under Pub Cont Code § 10261.5.

Withholds are cumulative and independent of deductions.

Section 9-1.07E does not include all withholds that may be taken; the Department may withhold other payments as specified.

9-1.07E(2) Progress Withholds

The Department withholds 10 percent of a partial payment for noncompliant progress. Noncompliant progress occurs when:

1. Total days to date exceed 75 percent of the revised Contract working days
2. Percent of working days elapsed exceeds the percent of value of work completed by more than 15 percent

The Engineer determines the percent of working days elapsed by dividing the total days to date by the revised Contract working days and converting the quotient to a percentage.

The Engineer determines the percent of value of work completed by summing payments made to date and the amount due on the current progress estimate, dividing this sum by the current total estimated value of the work, and converting the quotient to a percentage. These amounts are shown on the Progress Payment Voucher.

When the percent of working days elapsed minus the percent of value of work completed is less than or equal to 15 percent, the Department returns the withhold in the next progress payment.

9-1.07E(3) Performance Failure Withholds

During each estimate period you fail to comply with a Contract part, including submittal of a document as specified, the Department withholds a part of the progress payment. The documents include QC plans, schedules, traffic control plans, and water pollution control submittals.

For 1 performance failure, the Department withholds 25 percent of the progress payment but does not withhold more than 10 percent of the total bid.

For multiple performance failures, the Department withholds 100 percent of the progress payment but does not withhold more than 10 percent of the total bid.

9-1.07E(4) Stop Notice Withholds

The Department may withhold payments to cover claims filed under Civ Code § 3179 et seq.

Stop notice information may be obtained from the Office of External Accounts Payable, Division of Accounting.

9-1.07E(5) Penalty Withholds

Penalties include fines and damages that are proposed, assessed, or levied against you or the Department by a governmental agency or private lawsuit. Penalties are also payments made or costs incurred in settling alleged violations of federal, state, or local laws, regulations, requirements, or PLACs. The cost incurred may include the amount spent for mitigation or correcting a violation.

If you or the Department is assessed a penalty, the Department may withhold the penalty amount until the penalty disposition has been resolved. The Department may withhold penalty funds without notifying you.

Instead of the withhold, you may provide a bond equal to the highest estimated liability for any disputed penalties proposed.

9-1.07E(6)–9-1.07E(10) Reserved

9-1.07F Retentions

The Department does not retain moneys from progress payments due to the Contractor for work performed (Pub Cont Code § 7202).

9-1.07G–9-1.07K Reserved

9-1.08 PAYMENT AFTER CONTRACT ACCEPTANCE

9-1.08A General

Reserved

9-1.08B Payment Before Final Estimate

After Contract acceptance, the Department pays you based on the Engineer-prepared estimate that includes withholds and the balance due after deduction of previous payments.

9-1.08C Proposed Final Estimate

The Engineer estimates the amount of work completed and shows the amount payable in a proposed final estimate based on:

1. Contract items
2. Payment adjustments
3. Work paid by force account or agreed price
4. Extra work
5. Deductions

Submit either a written final estimate acceptance or a claim statement no later than the 30th day after receiving the proposed final estimate. Evidence of the Contractor's receipt of the final estimate and the Engineer's receipt of the Contractor's written acceptance or claim statement is a delivery service's proof of delivery or Engineer's written receipt if hand delivered.

If you claim that the final estimate is less than 90 percent of your total bid, the Department adjusts the final payment to cover your overhead. The adjustment is 10 percent of the difference between the total bid and the final estimate. The Department does not make this adjustment on a terminated contract.

9-1.08D Final Payment and Claims

9-1.08D(1) General

If you accept the proposed final estimate or do not submit a claim statement within 30 days of receiving the estimate, the Engineer furnishes the final estimate to you and the Department pays the amount due within 30 days. This final estimate and payment is conclusive except as specified in Sections 5-1.015, "Records," 6-1.075, "Guarantee," and 9-1.09, "Clerical Errors."

If you submit a claim statement within 30 days of receiving the Engineer's proposed final estimate, the Engineer furnishes a semifinal estimate to the Contractor and the Department pays the amount due within 30 days. The semifinal estimate is conclusive as to the amount of work completed and the amount payable except as affected by the claims or as specified in Sections 5-1.015, "Records," 6-1.075, "Guarantee," and 9-1.09, "Clerical Errors."

9-1.08D(2) Claim Statement

9-1.08D(2)(a) General

For each claim, submit a claim statement showing only the identification number that corresponds to the Full and Final Potential Claim Record and the final amount of additional payment requested except:

1. If the final amount of requested payment differs from the amount requested in the Full and Final Potential Claim Record
2. For a claim for quantities, withholds, deductions, liquidated damages, or change order bills
3. For an overhead claim

If the final amount of requested payment differs from the amount requested in the Full and Final Potential Claim Record, submit:

1. Identification number that corresponds to the Full and Final Potential Claim Record
2. Final amount of additional payment requested
3. Basis for the changed amount
4. Contract documentation that supports the changed amount
5. Statement of the reasons the Contract documentation supports the claim

The Engineer notifies you of an omission of or a disparity in the exclusive identification number. Within 15 days of the notification, correct the omission or disparity. If the omission or disparity is not resolved after the 15 days, the Engineer assigns a new number.

For a claim for quantities, withholds, deductions, or change order bills submit:

1. Final amount of additional payment requested
2. Enough detail to enable the Engineer to determine the basis and amounts of the additional payment requested

9-1.08D(2)(b) Overhead Claims

Include with an overhead claim:

1. Final amount of additional payment requested
2. Independent CPA audit report

Failure to submit the audit report with an overhead claim with the claim statement is a waiver of the overhead claim and operates as a bar to arbitration on the claim (Pub Cont Code § 10240.2).

The Department deducts an amount for field and home office overhead paid on added work from any claim for overhead. The value of the added work equals the value of the work completed minus the total bid. The home office overhead deduction equals 5 percent of the added work. The field office overhead deduction equals 5-1/2 percent of the added work.

If you intend to pursue a claim for reimbursement for field or home office overhead beyond that provided expressly by the Contract:

1. Notify the Engineer within 30 days of receipt of the proposed final estimate of your intent to seek reimbursement for specific overhead costs beyond that provided by the Contract
2. Specifically identify each claim and each date associated with each claim from which you seek reimbursement for specific overhead costs beyond that provided by the Contract
3. Timely submit all other claims
4. Within 30 days of receipt of the proposed final estimate, submit an audit report prepared by an independent CPA

    4.1. The audit report must show calculations with supporting documentation of actual home office and project field overhead costs

4.2. The calculations must specify the actual daily rates for both field and home office overhead for the entire duration of the project expressed as a rate per working day
4.3. The start and end dates of the actual project performance period, number of working days, overhead cost pools, and all allocation bases must be disclosed in the calculations of your actual field and home office overhead daily rates
4.4. Neither daily rate may include a markup for profit

5. Field overhead costs from which the daily rate is calculated must be:

5.1. Allowable under 48 CFR 31
5.2. Supported by reliable records
5.3. Related solely to the project
5.4. Incurred during the actual project performance period
5.5. Comprised of only time-related field overhead costs
5.6. Not a direct cost

6. Home office overhead costs from which the daily rate is calculated must be:

6.1. Allowable under 48 CFR 31
6.2. Supported by reliable records
6.3. Incurred during the actual project performance period
6.4. Comprised of only fixed home office overhead costs
6.5. Not a direct cost

The actual rate of time-related overhead is subject to authorization by the Engineer.

The CPA's audit must be performed under the Attestation Standards published by the American Institute of Certified Public Accountants. The CPA's audit report must express an opinion whether or not your calculations of your actual field and home office overhead daily rates comply with Section 9-1.08D(2)(b), "Overhead Claims." The attest documentation prepared by the CPA in connection with the audit must be reproduced and submitted for review with the audit report.

The Department provides markups for all work paid by force account. Overhead for field and home office costs are included in the markups. Overhead claims in excess of Contract markups are not allowed under the Contract. If you seek reimbursement for costs not allowed under the Contract, the Department does not pay your cost of performing the independent CPA examination specified in section 9-1.08D(2)(b), "Overhead Claims," including preparation of the audit report.

9-1.08D(2)(c) Declaration

Submit a declaration that includes the following language with the claim statement:

> I declare under penalty of perjury, according to the laws of the State of California, that the foregoing claims, with specific reference to the California False Claims Act (Govt Code § 12650 et seq.) and to the extent the project contains federal funding, the U.S. False Claims Act (31 USC § 3729 et seq.), are true and correct, and that this declaration was signed on _____(date)_____, 20__ at _____, California.

9-1.08D(2)(d) Waiver

A claim is waived if:

1. Claim does not have a corresponding Full and Final Potential Claim Record identification number
2. Claim does not have the same nature, circumstances, and basis of claim as the corresponding Full and Final Potential Claim Record
3. Claim is not included in the claim statement
4. You do not comply with the claim procedures
5. You do not submit the declaration specified in 9-1.08D(2)(c), "Declaration"

9-1.08D(3) Final Determination of Claims

Failure to allow timely access to claim supporting data when requested waives the claim.

The Department's costs in reviewing or auditing a claim not supported by the Contractor's accounting or other records are damages incurred by the State within the meaning of the California False Claims Act.

If the Engineer determines that a claim requires additional analysis, the Engineer schedules a board of review meeting. Meet with the board of review and make a presentation supporting the claim.

After claim review completion by the Engineer or board of review, the Department makes the final determination of claims and furnishes it to the Contractor.

After the determination, the Engineer furnishes a final estimate to the Contractor and the Department pays the amount due within 30 days. The final estimate is conclusive as to the amount of work completed and the amount payable except as specified in Sections 5-1.015, "Records," 6-1.075, "Guarantee," and 9-1.09, "Clerical Errors."

The Contractor's failure to comply with the claim procedures is a bar to arbitration under Pub Cont Code § 10240.2.

9-1.09 CLERICAL ERRORS

For 3 years after Contract acceptance, estimates and payments are open to correction and adjustment for clerical errors. Either the Department or the Contractor pays to the other the amount due except for clerical errors resulting in an adjustment less than $200; in which case, no payment is made.

9-1.10 ARBITRATION

Pub Cont Code § 10240 through 10240.13 provides for the resolution of contract claims by arbitration.

Start arbitration by filing a complaint with the Office of Administrative Hearings in Sacramento (1 CA Code Regs § 1350). File the arbitration complaint no later than 90 days after receiving the Department's final written decision on a claim (Pub Cont Code § 10240.1).

^^

SECTION 10 DUST CONTROL
(Issued 02-06-09)

Replace Section 10 with:
SECTION 10 (BLANK)

^^

SECTION 11 MOBILIZATION
(Issued 06-05-09)

Replace Section 11 with:
SECTION 11 (BLANK)

^^

SECTION 12 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES
(Issued 11-07-08)

In Section 12-1.01 in the 2nd paragraph, replace the 1st sentence with:

Attention is directed to Part 6 of the California MUTCD.

Replace Section 12-2.01 with:

12-2.01 FLAGGERS

Flaggers while on duty and assigned to traffic control or to give warning to the public that the highway is under construction and of any dangerous conditions to be encountered as a result thereof, shall perform their duties and shall be provided with the necessary equipment in conformance with Part 6 of the California MUTCD. The equipment shall be furnished and kept clean and in good repair by the Contractor at the Contractor's expense.

All flaggers shall wear safety apparel meeting the requirements of ANSI/ISEA 107-2004 for Class 2 or 3 garment and complying with 71 Fed Reg 67792.

In Section 12-3.01 replace the 1st paragraph with:

In addition to the requirements in Part 6 of the California MUTCD, all devices used by the Contractor in the performance of the work shall conform to the provisions in this Section 12-3.

In Section 12-3.06 in the 1st paragraph, replace the 2nd sentence with:

Construction area signs are shown in or referred to in Part 6 of the California MUTCD.

In Section 12-3.06 in the 4th paragraph, replace the 1st sentence with:

All construction area signs shall conform to the dimensions, color and legend requirements of the plans, Part 6 of the California MUTCD and these specifications.

In Section 12-3.06 in the 8th paragraph, replace the 1st sentence with:

Used signs with the specified sheeting material will be considered satisfactory if they conform to the requirements for visibility and legibility and the colors conform to the requirements in Part 6 of the California MUTCD.

^^

SECTION 14 (BLANK)

(Issued 06-01-11)

Replace Section 14 with:

SECTION 14 ENVIRONMENTAL STEWARDSHIP

14-1 GENERAL

14-1.01 GENERAL

Environmental stewardship includes both environmental compliance and environmental resource management.

If an ESA is shown on the plans:

1. The boundaries shown are approximate; the Department marks the exact boundaries on the ground
2. Do not enter the ESA unless authorized
3. If the ESA is breached, immediately:
   3.1. Secure the area and stop all operations within 60 feet of the ESA boundary
   3.2. Notify the Engineer
4. If the ESA is damaged, the Department determines what efforts are necessary to remedy the damage and who performs the remedy; you are responsible for remedies and charges.

14-2 CULTURAL RESOURCES

14-2.01 GENERAL

Reserved

14-2.02 ARCHAEOLOGICAL RESOURCES

If archaeological resources are discovered at the job site, do not disturb the resources and immediately:

1. Stop all work within a 60-foot radius of the discovery
2. Protect the discovery area
3. Notify the Engineer

The Department investigates. Do not move archaeological resources or take them from the job site. Do not resume work within the discovery area until authorized.

If, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of an archaeological find, or investigation or recovery of archeological materials, you will be compensated for resulting losses, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

If ordered, furnish resources to assist in the investigation or recovery of archaeological resources. This work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

14-2.03 ARCHAEOLOGICAL MONITORING AREA

Section 14-2.03 applies if an AMA is described in the Contract.

The Department assigns an archaeological monitor to monitor job site activities within the AMA. Do not work within the AMA unless the archeological monitor is present.

The Engineer and the Department archaeological monitor conduct an AMA location field review with you at least 5 business days before start of work. The Department marks the exact boundaries of the AMA on the ground.

If temporary fence (Type ESA) or other exclosure for an AMA is described in the Contract, install temporary fence (Type ESA) or other exclosure to define the boundaries of the AMA during the AMA location field review.

At least 5 business days before starting work within an AMA, submit a schedule of days and hours to be worked for the Engineer's approval. If you require changes in the schedule, submit an update for the Engineer's approval at least 5 business days before any changed work day.

If archaeological resources are discovered within an AMA, comply with Section 14-2.02, "Archaeological Resources."

14-2.04 HISTORIC STRUCTURES

Reserved

14-3 COMMUNITY IMPACTS AND ENVIRONMENTAL JUSTICE

Reserved

14-4 NATIVE AMERICAN CONCERNS

Reserved

14-5 AESTHETICS

Reserved

14-6 BIOLOGICAL RESOURCES

14-6.01 GENERAL

Reserved

14-6.02 BIRD PROTECTION

Protect migratory and nongame birds, their occupied nests, and their eggs.

The Department anticipates nesting or attempted nesting from February 15 to September 1.

The federal Migratory Bird Treaty Act, 16 USC § 703–711, and 50 CFR Pt 10 and Fish & Game Code §§ 3503, 3513, and 3800 protect migratory and nongame birds, their occupied nests, and their eggs.

The federal Endangered Species Act of 1973, 16 USC §§ 1531 and 1543, and the California Endangered Species Act, Fish & Game Code §§ 2050–2115.5, prohibit the take of listed species and protect occupied and unoccupied nests of threatened and endangered bird species.

The Bald and Golden Eagle Protection Act, 16 USC § 668, prohibits the destruction of bald and golden eagles and their occupied and unoccupied nests.

If migratory or nongame bird nests are discovered that may be adversely affected by construction activities or an injured or killed bird is found, immediately:

1. Stop all work within a 100-foot radius of the discovery.
2. Notify the Engineer.

The Department investigates. Do not resume work within the specified radius of the discovery until authorized.

When ordered, use exclusion devices, take nesting prevention measures, remove and dispose of partially constructed and unoccupied nests of migratory or nongame birds on a regular basis to prevent their occupation, or perform any combination of these. This work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

Prevent nest materials from falling into waterways.

Bird protection that causes a delay to the controlling activity is a condition unfavorable to the suitable prosecution of work as specified in Section 8-1.05, "Temporary Suspension of Work."

14-7 PALEONTOLOGICAL RESOURCES

If paleontological resources are discovered at the job site, do not disturb the material and immediately:

1. Stop all work within a 60-foot radius of the discovery
2. Protect the area
3. Notify the Engineer

The Department investigates and modifies the dimensions of the protected area if necessary. Do not move paleontological resources or take them from the job site. Do not resume work within the specified radius of the discovery until authorized.

14-8 NOISE AND VIBRATION

14-8.01 GENERAL

Reserved

14-8.02 NOISE CONTROL

Do not exceed 86 dBA LMax at 50 feet from the job site activities from 9 p.m. to 6 a.m.

Equip an internal combustion engine with the manufacturer-recommended muffler. Do not operate an internal combustion engine on the job site without the appropriate muffler.

14-9 AIR QUALITY

14-9.01 AIR POLLUTION CONTROL

Comply with air pollution control rules, regulations, ordinances, and statutes that apply to work performed under the Contract, including air pollution control rules, regulations, ordinances, and statutes provided in Govt Code § 11017 (Pub Cont Code § 10231).

Do not burn material to be disposed of.

14-9.02 DUST CONTROL

Prevent and alleviate dust by applying water, dust palliative, or both under Section 14-9.01.

Apply water under Section 17, "Watering."

Apply dust palliative under Section 18,"Dust Palliative."

If ordered, apply water, dust palliative, or both to control dust caused by public traffic. This work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

14-10 SOLID WASTE DISPOSAL AND RECYCLING

14-10.01 SOLID WASTE DISPOSAL AND RECYCLING

Submit an annual Solid Waste Disposal and Recycling Report between January 1 and 15 for each year work is performed under the Contract at any time during the previous calendar year. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 through December 31 of the previous calendar year.

Submit a final annual Solid Waste Disposal and Recycling Report within 5 business days after Contract acceptance. Show the types and amounts of project-generated solid waste taken to or diverted from landfills or reused on the project from January 1 to Contract acceptance.

For each failure to submit a completed form, the Department withholds $10,000.

14-11 HAZARDOUS WASTE AND CONTAMINATION

14-11.01 GENERAL

Reserved

14-11.02 ASBESTOS AND HAZARDOUS SUBSTANCES

Upon discovery, immediately stop working in and notify the Engineer of areas where asbestos or a hazardous substance is present if the:

1. Contractor reasonably believes the substance is asbestos as defined in Labor Code § 6501.7 or a hazardous substance as defined in Health & Safety Code §§ 25316 and 25317
2. Presence is not described in the Contract
3. Substance has not been made harmless

14-12 OTHER INTERAGENCY RELATIONS

Reserved

14-13 PAYMENT

Payment for work specified in Section 14 is included in the payment for the bid items involved unless:

1. Bid item for the work is shown in the verified Bid Item List
2. Work is specified as paid for as extra work

^^

SECTION 15 EXISTING HIGHWAY FACILITIES

(Issued 05-01-09)

In Section 15-1.02 replace the 1st paragraph with:

Existing facilities which are to remain in place shall be protected in conformance with the provisions in Sections 5-1.18, "Property and Facility Preservation," and 7-1.12, "Indemnification and Insurance."

^^

SECTION 19 EARTHWORK

(Issued 09-16-11)

Replace Section 19-1.02 with:

19-1.02 (BLANK)

Replace Section 19-1.03 with:

19-1.03 GRADE TOLERANCE

Immediately prior to placing subsequent layers of material thereon, the grading plane shall conform to one of the following:

A. When hot mix asphalt is to be placed on the grading plane, the grading plane at any point shall not vary more than 0.05 foot above or below the grade established by the Engineer.
B. When subbase or base material to be placed on the grading plane is to be paid for by the ton, the grading plane at any point shall not vary more than 0.10 foot above or below the grade established by the Engineer.
C. When the material to be placed on the grading plane is to be paid for by the cubic yard, the grading plane at any point shall be not more than 0.05 foot above the grade established by the Engineer.

In Section 19-3.025C replace the 1st paragraph with:

Cementitious material used in soil cement bedding shall conform to the provisions in Section 90-2.01, "Cementitious Materials." Supplementary cementitious material will not be required.

In Section 19-3.025C replace the 4th paragraph with:

The aggregate, cementitious material, and water shall be proportioned either by weight or by volume. Soil cement bedding shall contain not less than 282 pounds of cementitious material per cubic yard. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate while being placed.

In Section 19-3.06 replace the 9th paragraph with:

Unless otherwise shown on the plans or specified in these specifications or the special provisions, material for structure backfill to be compacted to a relative compaction of not less than 90 percent, except material to be placed behind retaining walls, shall consist of material free of rocks, broken concrete, other solid material exceeding 3 inches in greatest dimension, or organic or other unsatisfactory material.

In Section 19-3.062 replace the 1st paragraph with:

Slurry cement backfill shall consist of a fluid, workable mixture of aggregate, cementitious material, and water.

In Section 19-3.062 replace the 5th paragraph with:

Cementitious material shall conform to the provisions in Section 90-2.01, "Cementitious Materials." Supplementary cementitious material will not be required.

In Section 19-3.062 replace the 8th paragraph with:

The aggregate, cementitious material, and water shall be proportioned either by weight or by volume. Slurry cement backfill shall contain not less than 188 pounds of cementitious material per cubic yard. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate while being placed.

^^

SECTION 20 EROSION CONTROL AND HIGHWAY PLANTING
(Issued 04-20-12)

Replace Section 20-2.03 with:

20-2.03 SOIL AMENDMENT

Soil amendment must comply with the Food & Agri Code.

In Section 20-2.10 delete the 8th, 9th, and 10th paragraphs.

In Section 20-3.04A delete the last paragraph.

In Section 20-4.026 replace the 3rd paragraph with:

Oil or pelleted forms of pesticides for weed control shall not be used.

Replace Section 20-4.055 with:

20-4.055 PRUNING

Prune plants under ANSI A300 (Part 1) published by the Tree Care Industry Association.

^^

SECTION 24 LIME STABILIZATION
(Issued 06-05-09)

Replace Section 24 with:

SECTION 24 LIME STABILIZED SOIL

24-1.01 GENERAL

24-1.01A Summary

Section 24 includes specifications for stabilizing soil by mixing lime and water with soil and compacting the mixture to the specified dimensions.

24-1.01B Definitions

lime: Quicklime made from high-calcium or dolomitic sources specified under ASTM C 51. For high-calcium quicklime, the calcium oxide content must be greater than 90 percent. For dolomitic quicklime, the calcium oxide content must be greater than 55 percent and the combined calcium oxide and magnesium oxide content must be greater than 90 percent.

mellowing period: The time between the initial and final mixing to promote initial chemical reactions between lime, water, and soil.

24-1.01C Submittals

From 30 to 180 days before use, submit one 10-pound sample of each lime product proposed and from each source.

Submit lime samples in airtight containers under ASTM C 50. Mark the sample date on the container. Include the MSDS and chemical and physical analysis with the submittal.

With the lime samples, submit a Certificate of Compliance from the pre-qualified lime source under Section 6-1.07, "Certificates of Compliance," with a statement certifying the lime furnished is the same as that pre-qualified.

Fifteen days before starting soil stabilization activities, submit for the Engineer's approval a laboratory to perform quality control tests. The laboratory must be qualified under the Department's Independent Assurance Program.

Before you apply lime in slurry form, submit the slurry's lime content for Engineer's approval 25 days before application.

Before performing quality control sampling and testing, submit the time and location the sampling and testing will occur. Submit quality control testing results within 24 hours of receiving the results.

Submit a weighmaster certificate or bill of lading with each load of lime delivered to the jobsite.

24-1.01D Quality Control and Assurance

General

Perform quality control testing in the presence of the Engineer.

Place unique, sequentially numbered lock seals on each load and affix them to trailer blow down valves that are locked open. The bill of lading for each lime delivery must have that specific lock seal number legibly and visibly imprinted.

The Engineer samples each lime delivery truck at the job site and randomly tests them off-site.

Pre-qualification of Lime Sources

Lime sources must be listed on the Department's pre-qualified products list. The list is available at the METS web site.

The pre-qualified list for lime sources describes the application procedures for inclusion on the list.

Preparing Soil

After you prepare an area for lime soil stabilization, test the soil to be stabilized every 500 cubic yards for relative compaction under California Test 231 and moisture content under California Test 226, and verify the surface grades.

Applying Lime

The Engineer determines the final application rate for each lime product proposed from the samples submitted. If the soil being stabilized changes, the Engineer changes the application rate. Based on California Test 373, the Engineer reports the application rates as the percent of lime by dry weight of soil. The Engineer provides the optimum moisture content determined under California Test 373 for each application rate.

Before applying lime, measure the temperature at the ground surface.

If lime in dry form is used, the Engineer verifies the application rate using the drop pan method once per 40,000 square feet stabilized, or twice per day, whichever is greater.

If lime in slurry form is used, report the quantity of slurry placed by measuring the volume of slurry in the holding tank once per 40,000 square feet stabilized, or twice per day, whichever is greater.

Mixing

For each day of initial mixing, test the moisture content. Sample the material immediately after initial mixing.

Randomly test the adequacy of the final mixing with a phenolphthalein indicator solution.

During mixing operations, measure the ground temperature at full mixing depth.

After mixing and before compacting, determine maximum density under California Test 216 from composite samples of the mixed material and at each distinct change in material. Test the moisture content of the mixed material under California Test 226. Test the gradation for compliance with "Materials."

Compaction

Test relative compaction on a wet weight basis.

After initial compaction, determine in-place density under California Test 231 and moisture content under California Test 226 at the same locations. The testing frequency must be 1 test per 250 cubic yards of lime stabilized soil. Test in 0.50-foot depth intervals.

Before requesting to compact material in layers greater than 0.50 foot, construct a test strip in the production area and demonstrate the test strip passes compaction tests using the proposed thickness. The test strip must contain no more material than 1 day's production. The Engineer tests at not more than 0.50-foot depth intervals regardless of the thickness of your layers.

Construct test pads by scraping away material to the depth ordered by the Engineer. If a compaction test fails corrective action must include the layers of material already placed above the test pad elevation.

Finish Grading

Do not proceed with construction activities for subsequent layers of material until the Engineer verifies the final grades of the lime stabilized soil.

Dispute Resolution

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer within 5 days of receiving a test result if you dispute the test result.

If you or the Engineer dispute each other's test results, submit written quality control test results and copies of paperwork including worksheets used to determine the disputed test results to the Engineer. An Independent Third Party (ITP) performs referee testing. Before the ITP participates in a dispute resolution, the ITP must be accredited under the Department's Independent Assurance Program. The ITP must be independent of the project. By mutual agreement, the ITP is chosen from:

1. A Department laboratory
2. A Department laboratory in a district or region not in the district or region the project is located
3. The Transportation Laboratory
4. A laboratory not currently employed by you or your lime producer

If split quality control or acceptance samples are not available, the ITP uses any available material representing the disputed material for evaluation.

24-1.02 MATERIALS

24-1.02A Lime

Lime must comply with ASTM C 977 and the following:

Lime

Quality Characteristic	ASTM	Specification
Available Calcium and Magnesium Oxide(min., %)	C 25[a]	High Calcium Quicklime: CaO > 90 Dolomitic Quicklime: CaO > 55 and CaO + MgO > 90
Loss on ignition (max., %)	C 25	7 (total loss) 5 (carbon dioxide) 2 (free moisture)
Slaking rate	C 110	30 °C rise in 8 minutes

Notes:
[a] You may use ASTM C25 or ASTM C1301 and ASTM C1271.

A 0.5-pound sample of lime dry-sieved in a mechanical sieve shaker for 10 minutes ±30 seconds must comply with:

Sieve Sizes	Percentage Passing
3/8-inch	98-100

Slurry must:

1. Be free of contaminants
2. Contain at least the minimum dry solids
3. Have uniform consistency

If you prepare lime slurry, prepare it at the jobsite.

24-1.02B Water

If available, use potable water. Inform the Engineer if a water source other than potable water is used. If not using potable water, water for mixing soil and lime must:

1. Contain no more than 650 parts per million of chlorides as Cl, and no more than 1,300 parts per million of sulfates as SO_4
2. Not contain an amount of impurities that will cause a reduction in the strength of the stabilize soil

24-1.02C Mixed Material

Take a composite sample from 5 random locations after initial mixing. The moisture content of the composite sample tested under California Test 226 must be a minimum of 3 percent greater than optimum. Determine the moisture versus density relationship of the composite sample material determined under California Test 216, except Part 2, Section E, Paragraph 6 is modified as follows:

> After adjustment of the moisture content, compact each of the remaining test specimens in the mold, then record the water adjustment, tamper reading, and the corresponding adjusted wet density from the chart on

Table 1 using the column corresponding to the actual wet weight of the test specimen compacted. Note each of these wet weights on Line I.

The mixed material before compaction excluding rock must comply with:

Sieve Sizes	Percentage Passing
1"	98 - 100
No. 4	60 - 100

24-1.02D Curing Treatment

Curing treatment may be any of the following:

1. Water cure
2. Curing seal
3. Moist material blanket

Curing seal must be SS or CSS grade asphaltic emulsion under Section 94, "Asphaltic Emulsions."

24-1.03 CONSTRUCTION

24-1.03A General

If using different types of lime or lime from more than one source, do not mix them. The Engineer determines separate application rates.

Deliver lime in full loads unless it is the last load needed for a work shift.

Apply lime at ground temperatures above 35 °F. Do not apply lime if you expect the ground temperature to drop below 35 °F before you complete mixing and compacting.

During mixing, maintain the in-place moisture of the soil to be stabilized a minimum 3 percent above the optimum moisture determined under California Test 216 as modified in "Mixed Material." During compaction and finish grading, add water to the surface to prevent drying until the next layer of mixed material is placed, or until you apply curing treatment.

Scarify the surface of lime stabilized soil at least 2 inches between each layer. Do not scarify the final surface of the lime stabilized soil.

Between the time of applying lime and 3 days after applying curing treatment, only allow equipment or vehicles on the soil being stabilized that are essential to the work.

24-1.03B Preparing Soil

Except for soil clods, remove rocks or solids larger than 1/3 of the layer thickness. Regardless of the layer thickness, remove rocks and solids greater than 4 inches. Notify the Engineer if you encounter rocks or solids greater than 1/3 of the layer thickness.

Before adding lime, place the soil to be stabilized to within 0.08 foot of the specified lines and grades and compact to not less than 90 percent relative compaction.

24-1.03C Applying Lime

Apply lime uniformly over the area to be stabilized using a vane spreader.

The Engineer determines the final application rate. Do not vary from this application rate by more than 5 percent.

Apply lime in dry form. If you request and the Engineer approves, you may apply lime in slurry form.

Lime slurry must be in suspension during application. Apply lime slurry uniformly making successive passes over a measured section or roadway until the specified lime content is reached. Apply the residue from lime slurry over the length of the roadway being processed.

24-1.03D Mixing

Lime and soil to be stabilized must be mixed uniformly at least twice to within 0.10 foot of the specified depth at any point. If the mixing depth exceeds the specified depth by more than 10 percent, add lime in proportion to the exceeded depth. The Department does not pay for this added lime.

Mix lime on the same day it is applied. After the initial mixing, allow a mellowing period for at least 36 hours before final mixing. Moisture content during the mellowing period determined under California Test 226 must be at

least 3 percent higher than the optimum moisture content. You may add water and mix during the mellowing period.

Remix until the mixture is uniform with no streaks or pockets of lime.

Except for clods larger than 1 inch, mixed material must have a color reaction with sprayed phenolphthalein alcohol indicator solution.

Complete all the mixing work within 7 days of the initial application of lime.

24-1.03E Compaction

Begin compacting immediately after final mixing, but not less than 36 hours after the beginning of initial mixing.

Compact by using sheepsfoot or segmented wheel rollers immediately followed by steel drum or pneumatic-tired rollers. Do not use vibratory rollers.

If you request and the Engineer approves, you may compact mixed material in layers greater than 0.50 foot.

If the specified thickness is 0.50 foot or less, compact in one layer. If the specified thickness is more than 0.50 foot, compact in 2 or more layers of approximately equal thickness. The maximum compacted thickness of any one layer must not exceed 0.50 foot unless you first demonstrate your equipment and methods provide uniform distribution of lime and achieve the specified compaction.

Use other compaction methods in areas inaccessible to rollers.

Compact the lime stabilized soil to at least 95 percent relative compaction determined under California Test 216 as modified under "Mixed Material." The relative compaction is determined on a wet weight basis.

24-1.03F Finish Grading

Maintain the moisture content of the lime stabilized soil through the entire finish grading operation at a minimum of 3 percent above optimum moisture content.

The finished surface of the lime stabilized soil must not vary more than 0.08 foot above or below the grade established by the Engineer unless the lime stabilized soil is to be covered by material paid for by the cubic yard, in which case the finished surface may not vary above the grade established by the Engineer.

If lime stabilized soil is above the allowable tolerance, trim, remove, and dispose of the excess material. Do not leave loose material on the finished surface. If finish rolling cannot be completed within 2 hours of trimming, defer trimming.

If lime stabilized soil is below the allowable tolerance, you may use trimmed material to fill low areas only if final grading and final compaction occurs within 48 hours of beginning initial compaction. Before placing trimmed material, scarify the surface of the area to be filled at least 2 inches deep.

Finish rolling of trimmed surfaces must be performed with at least 1 complete coverage with steel drum or pneumatic-tired rollers.

24-1.03G Curing

General

Choose the method of curing.

Apply the chosen cure method within 48 hours of completing the sheepsfoot or segmented wheel compaction. Apply the chosen cure method within the same day of any trimming and finish grading.

Water Cure

Water may be used to cure the finished surface before you place a moist material blanket, or apply curing seal. Keep the surface above the optimum moisture content of the lime stabilized soil. Use this method for no more than 3 days, after which you must place a curing seal or moist material blanket.

Curing Seal

Curing seal equipment must have a gage indicating the volume of curing seal in the storage tank.

If curing seal is used, apply it:

1. To the finished surface of lime stabilized soil under Section 94-1.06, "Applying," of the Standard Specifications
2. At a rate from 0.10 to 0.20 gallon per square yard. The Engineer determines the exact rate
3. When the lime stabilized soil is at optimum moisture
4. When the ambient temperature is above 40 °F and rising

Repair damaged curing seal the same day the damage occurs.

Moist Material Blanket

Moist material blanket consists of moist structural material. Moist material blanket may be a temporary or permanent layer of material of sufficient thickness to prevent drying of the lime stabilized soil. You may use moist material blanket if the lime stabilized soil can bear the weight of construction equipment. Maintain the moist material blanket above the optimum moisture content, as appropriate, until the next structural layer is placed.

24-1.04 MEASUREMENT AND PAYMENT

Lime stabilized soil is measured by the square yard determined from horizontal measurements of the planned surface of the lime stabilized soil.

Curing seal is measured under Section 94, "Asphaltic Emulsions." The amount of curing seal used is determined from the gauge specified for the curing equipment.

The contract item prices for the work involved with lime stabilized soil are paid:

1. Per square yard for lime stabilized soil
2. Per ton for lime
3. Per ton for asphaltic emulsion (curing seal)

Payment for the contract items involved with lime stabilized soil includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the lime stabilized soil, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The Department does not adjust payment for lime.

Quantities of lime wasted or disposed of in a manner not specified, or remaining on hand after completion of the work, will not be paid for. If you use a partial load of lime, weigh the truck and the remaining lime on a scale under Section 9-1.01, "Measurement of Quantities," and submit a weighmaster certificate to the Engineer.

Full compensation for preparing soil to be stabilized is included in the contract price paid per square yard for lime stabilized soil, and no separate payment is made therefor, except removing and disposing of rocks and solids larger 1/3 of the layer thickness and larger than 4 inches from native soil or embankment other than imported borrow is paid for as extra work as provided in Section 4-1.03D, "Extra Work." Removing and disposing of rocks and solids larger than 1/3 of the lift thickness and larger than 4 inches from imported borrow is at your expense.

Full compensation for mixing, compacting, and maintaining the moisture content of the lime stabilized soil is included in the contract price paid per square yard for lime stabilized soil, and no separate payment is made therefor.

Full compensation for applying lime is included in the contract price paid per ton for lime, and no additional compensation is allowed therefor.

If the dispute resolution ITP determines the Engineer's test results are correct, the Engineer deducts the ITP's testing costs from payments. If the ITP determines your test results are correct, the State pays the ITP testing costs.

^^

SECTION 25 AGGREGATE SUBBASES
(Issued 02-16-07)

In Section 25-1.02A replace the 1st paragraph with:

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

   5.1. Asphalt concrete

5.2. Portland cement concrete
5.3. Lean concrete base
5.4. Cement treated base

Replace Section 25-1.02B with:

25-1.02B Class 4 Aggregate Subbase

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

   5.1. Asphalt concrete
   5.2. Portland cement concrete
   5.3. Lean concrete base
   5.4. Cement treated base

^^

SECTION 26 AGGREGATE BASES
(Issued 02-16-07)

In Section 26-1.02A replace the 1st paragraph with:

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

   5.1. Asphalt concrete
   5.2. Portland cement concrete
   5.3. Lean concrete base
   5.4. Cement treated base

In Section 26-1.02B replace the 1st paragraph with:

Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:

   5.1. Asphalt concrete
   5.2. Portland cement concrete
   5.3. Lean concrete base

5.4. Cement treated base

^^

SECTION 27 CEMENT TREATED BASES
(Issued 07-31-07)

In Section 27-1.02 replace the 1st paragraph with:

Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

In Section 27-1.02 replace the 3rd paragraph with:

Aggregate for use in Class A cement treated base shall be of such quality that when mixed with cement in an amount not to exceed 5 percent by weight of the dry aggregate and compacted at optimum moisture content, the compressive strength of a sample of the compacted mixture shall not be less than 750 pounds per square inch at 7 days, when tested by California Test 312.

In Section 27-1.02 replace the 4th paragraph with:

Aggregate for use in Class B cement treated base shall have a Resistance (R-value) of not less than 60 before mixing with cement and a Resistance (R-value) of not less than 80 after mixing with cement in an amount not to exceed 2.5 percent by weight of the dry aggregate.

In Section 27-1.07 replace the 9th paragraph with:

When surfacing material is hot mix asphalt, the low areas shall be filled with hot mix asphalt conforming to the requirements for the lowest layer of hot mix asphalt to be placed as surfacing. This filling shall be done as a separate operation prior to placing the lowest layer of surfacing, and full compensation for this filling will be considered as included in the contract price paid for cement treated base and no additional compensation will be allowed therefor.

^^

SECTION 28 LEAN CONCRETE BASE
(Issued 05-15-09)

In Section 28-1.02 replace the 1st paragraph with:

Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

In Section 28-1.02 replace the 6th paragraph with:

Aggregate shall be of such quality that, when mixed with cement in an amount not to exceed 300 pounds per cubic yard, and tested in conformance with the requirements in California Test 548, the compressive strength of a sample will be not less than 700 pounds per square inch at 7 days.

Replace Section 28-1.05 with:

Placing of lean concrete base shall conform to the provisions for placing concrete pavement in Section 40-3.04, "Placing Concrete," except that the third paragraph in Section 40-3.04A, "General," shall not apply.

Unless otherwise required by the plans or the special provisions, lean concrete base shall be constructed in not less than 12-foot widths separated by construction joints. Lean concrete base constructed monolithically in widths greater than 26 feet shall be constructed with a longitudinal contraction joint offset not more than 3 feet from the centerline of the width being constructed.

Longitudinal contraction joints in lean concrete base shall be constructed in conformance with the provisions in Section 40-3.08E, "Sawing Method."

When concrete pavement is to be placed over lean concrete base, longitudinal construction joints and longitudinal contraction joints in the lean concrete base shall not be within one foot of planned longitudinal contraction joints nor longitudinal construction joints in the concrete pavement.

Lean concrete base shall not be mixed nor placed while the atmospheric temperature is below 35 °F, and shall not be placed on frozen ground.

In Section 28-1.06 replace the 1st and 2nd paragraphs with:

Lean concrete base shall be spread, compacted, and shaped in conformance with the provisions in Section 40-3.04D, "Stationary Side Form Construction," and Section 40-3.04E, "Slip-Form Construction."

In advance of curing operations, lean concrete base to be surfaced with hot mix asphalt shall be textured with a drag strip of burlap, a broom or a spring steel tine device which will produce scoring in the finished surface. The scoring shall be parallel with the centerline or transverse thereto. The operation shall be performed at a time and in a manner to produce the coarsest texture practical for the method used.

In Section 28-1.08 replace the 2nd paragraph with:

Hardened lean concrete base with a surface lower than 0.05 foot below the grade established by the Engineer shall be removed and replaced with lean concrete base which complies with these specifications, or if permitted by the Engineer, the low areas shall be filled with pavement material as follows:

1. When pavement material is hot mix asphalt, the low areas shall be filled with hot mix asphalt conforming to the requirements for the lowest layer of hot mix asphalt to be placed as pavement. This shall be done as a separate operation prior to placing the lowest layer of pavement, and full compensation for this filling will be considered as included in the contract price paid per cubic yard for lean concrete base and no additional compensation will be allowed therefor.
2. When pavement material is portland cement concrete, the low areas shall be filled with pavement concrete at the time and in the same operation that the pavement is placed. Full compensation for this filling will be considered as included in the contract price paid per cubic yard for lean concrete base and no additional compensation will be allowed therefor.

^^

SECTION 29 TREATED PERMEABLE BASES
(Issued 05-15-09)

In Section 29-1.02B replace the 2nd paragraph with:

Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

In Section 29-1.04A replace the 1st paragraph with:

Aggregates and asphalt for asphalt treated permeable base shall be stored, proportioned and mixed in the same manner provided for storing, proportioning and mixing aggregates and asphalt for hot mix asphalt in Section 39-1.08, "Production," except as follows:

1. The aggregate need not be separated into sizes.
2. The temperature of the aggregate before adding the asphalt binder shall be not less than 275° F nor more than 325° F.
3. Asphalt treated permeable base stored in excess of 2 hours shall not be used in the work.
4. The aggregate shall be combined with 2.5 percent paving asphalt by weight of the dry aggregate. After testing samples of the Contractor's proposed aggregate supply, the Engineer may order an increase or decrease in the asphalt content. If an increase or decrease is ordered, and the increase or decrease exceeds the specified amount by more than 0.1 percent by weight of the dry aggregate, the compensation payable to the Contractor for the asphalt treated permeable base will be increased or decreased on the basis of the total increase or decrease in asphalt.

5. The asphalt content of the asphalt mixture will be determined, at the option of the Engineer, by extraction tests in conformance with the requirements in California Test 310 or 362, or will be determined in conformance with the requirements in California Test 379. The bitumen ratio pounds of asphalt per 100 pounds of dry aggregate shall not vary by more than 0.5 pound of asphalt above or 0.5 pound of asphalt below the amount designated by the Engineer. Compliance with this requirement will be determined either by taking samples from trucks at the plant or from the mat behind the paver before rolling. If the sample is taken from the mat behind the paver, the bitumen ratio shall be not less than the amount designated by the Engineer, less 0.7 pound of asphalt per 100 pounds of dry aggregate.

In Section 29-1.04B replace the 2nd paragraph with:

Cement treated permeable base shall contain not less than 287 pounds of cement per cubic yard.

In Section 29-1.05 replace the 1st paragraph with:

Asphalt treated permeable base shall be spread and compacted as specified for hot mix asphalt under the "Method" construction process in Section 39, "Hot Mix Asphalt," and these specifications.

In Section 29-1.05 in the 8th paragraph, replace the 2nd sentence with:

The filter fabric shall conform to the provisions in Section 88-1.02, "Filtration," and shall be placed in conformance with the provisions for placing filter fabric for edge drains in Section 68-3.03, "Installation."

In Section 29-1.06 replace the 1st and 2nd paragraphs with:

Cement treated base shall be placed, spread, compacted, and shaped in conformance with the provisions in Section 40-3.04D, "Stationary Side Form Construction," and Section 40-3.04E, "Slip-Form Construction," except that vibrators shall not be used and the third paragraph in Section 40-3.04A, "General," shall not apply.

In Section 29-1.06 in the 9th paragraph, replace the 2nd sentence with:

The filter fabric shall conform to the provisions in Section 88-1.02, "Filtration," and shall be placed in conformance with the provisions for placing filter fabric for edge drains in Section 68-3.03, "Installation."

In Section 29-1.07 replace the 2nd paragraph with:

Hardened treated permeable base with a surface lower than 0.05 foot below the grade established by the Engineer shall be removed and replaced with treated permeable base which complies with these specifications, or if permitted by the Engineer, the low areas shall be filled with pavement material as follows:

1. When pavement material is hot mix asphalt, the low areas shall be filled with hot mix asphalt conforming to the requirements for the lowest layer of hot mix asphalt to be placed as pavement. This shall be done as a separate operation prior to placing the lowest layer of pavement.
2. When pavement material is portland cement concrete, the low areas shall be filled with pavement concrete at the time and in the same operation in which the pavement is placed.
3. Full compensation for filling low areas will be considered as included in the contract price paid per cubic yard for treated permeable base and no additional compensation will be allowed therefor.

^^

SECTION 37 BITUMINOUS SEALS
(Issued 06-05-09)

In Section 37-1.03 replace the 4th through 6th paragraphs with:

On 2-lane two-way roadways, W8-7 "LOOSE GRAVEL" signs and W13-1 (35) speed advisory signs shall be furnished and placed adjacent to both sides of the traveled way where screenings are being spread on a traffic lane.

The first W8-7 sign in each direction shall be placed where traffic first encounters loose screenings, regardless of which lane the screenings are being spread on. The W13-1 (35) signs need not be placed in those areas with posted speed limits of less than 40 MPH. The signs shall be placed at maximum 2,000-foot intervals along each side of the traveled way and at public roads or streets entering the seal coat area as directed by the Engineer.

On multilane roadways (freeways, expressways and multilane conventional highways) where screenings are being spread on a traffic lane, W8-7 "LOOSE GRAVEL" signs and W13-1 (35) speed advisory signs shall be furnished and placed adjacent to the outside edge of the traveled way nearest to the lane being worked on. The first W8-7 sign shall be placed where the screenings begin with respect to the direction of travel on that lane. The W13-1 (35) signs need not be placed in those areas with posted speed limits of less than 40 MPH. The signs shall be placed at maximum 2,000-foot intervals along the edge of traveled way and at on-ramps, public roads or streets entering the seal coat area as directed by the Engineer.

The W8-7 and W13-1 signs shall be maintained in place at each location until final brooming of the seal coat surface at that location is completed. The W8-7 and W13-1 signs shall conform to the provisions for construction area signs in Section 12, "Construction Area Traffic Control Devices." The signs may be set on temporary portable supports with the W13-1 below the W8-7 or on barricades with the W13-1 sign alternating with the W8-7 sign.

In Section 37-1.07 replace the 2nd paragraph with:

Rollers shall be oscillating type pneumatic-tired rollers. A minimum of 2 pneumatic-tired rollers conforming to the provisions in Section 39-3.03 "Spreading and Compacting Equipment," shall be furnished.

In Section 37-1.09 replace the 2nd paragraph with:

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying seal coat, complete in place, including furnishing, placing, maintaining, and removing W8-7 and W13-1 signs, when required, and temporary supports or barricades for the signs, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

In Section 37-2.05 replace the 6th paragraph with:

In addition to conforming to the provisions in Section 5-1.10, "Equipment," the identifying number of mixer-spreader trucks shall be at least 2 inches in height, located on the front and rear of the vehicle.

^^

SECTION 39 ASPHALT CONCRETE
(Issued 10-19-12)

Replace Section 39 with:

SECTION 39 HOT MIX ASPHALT

39-1 GENERAL

39-1.01 DESCRIPTION

Section 39 includes specifications for producing and placing hot mix asphalt (HMA) by mixing aggregate and asphalt binder at a mixing plant and spreading and compacting the HMA mixture.

The special provisions specify one or more types of HMA, including:

1. Type A
2. Type B
3. Open graded friction course (OGFC). OGFC includes hot mix asphalt (open graded)[HMA-O], rubberized hot mix asphalt (open graded) [RHMA-O] and rubberized hot mix asphalt (open graded high binder) [RHMA-O-HB]

4. Rubberized hot mix asphalt (gap graded) [RHMA-G]

The special provisions specify the HMA construction process, including:

1. Standard
2. Method
3. Quality Control / Quality Assurance (QC / QA)

39-1.02 MATERIALS

39-1.02A Geosynthetic Pavement Interlayer

Geosynthetic pavement interlayer must comply with the specifications in Section 88-1.07, "Pavement Interlayer," for the type of interlayer shown on the plans.

39-1.02B Tack Coat

Tack coat must comply with the specifications for asphaltic emulsion in Section 94, "Asphaltic Emulsion," or asphalt binder in Section 92, "Asphalts." Choose the type and grade.

Notify the Engineer if you dilute asphaltic emulsion with water. The weight ratio of added water to asphaltic emulsion must not exceed 1 to 1.

Measure added water either by weight or volume in compliance with the specifications for weighing, measuring, and metering devices under Section 9-1.01, "Measurement of Quantities," or you may use water meters from water districts, cities, or counties. If you measure water by volume, apply a conversion factor to determine the correct weight.

With each dilution, submit in writing:

1. The weight ratio of water to bituminous material in the original asphaltic emulsion
2. The weight of asphaltic emulsion before diluting
3. The weight of added water
4. The final dilution weight ratio of water to asphaltic emulsion

39-1.02C Asphalt Binder

Asphalt binder in HMA must comply with Section 92, "Asphalts," or Section 39-1.02D, "Asphalt Rubber Binder." The special provisions specify the grade.

Asphalt binder for geosynthetic pavement interlayer must comply with Section 92, "Asphalts." Choose from Grades PG 64-10, PG 64-16, or PG 70-10.

39-1.02D Asphalt Rubber Binder

General

Use asphalt rubber binder in RHMA-G, RHMA-O, and RHMA-O-HB. Asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. Crumb rubber modifier (CRM)

The combined asphalt binder and asphalt modifier must be 80.0 ± 2.0 percent by weight of the asphalt rubber binder.

Asphalt Modifier

Asphalt modifier must be a resinous, high flash point, and aromatic hydrocarbon, and comply with:

Asphalt Modifier for Asphalt Rubber Binder

Quality Characteristic	ASTM	Specification
Viscosity, m^2/s (x 10^{-6}) at 100 °C	D 445	X ± 3 [a]
Flash Point, CL.O.C., °C	D 92	207 minimum
Molecular Analysis		
Asphaltenes, percent by mass	D 2007	0.1 maximum
Aromatics, percent by mass	D 2007	55 minimum

Note:
[a] The symbol "X" is the proposed asphalt modifier viscosity. "X" must be between 19 and 36. A change in "X" requires a new asphalt rubber binder design.

Asphalt modifier must be from 2.0 percent to 6.0 percent by weight of the asphalt binder in the asphalt rubber binder.

Crumb Rubber Modifier

CRM consists of a ground or granulated combination of scrap tire CRM and high natural CRM. CRM must be 75.0 ± 2.0 percent scrap tire CRM and 25.0 ± 2.0 percent high natural CRM by total weight of CRM. Scrap tire CRM must be from any combination of automobile tires, truck tires, or tire buffings.

Sample and test scrap tire CRM and high natural CRM separately. CRM must comply with:

Crumb Rubber Modifier for Asphalt Rubber Binder

Quality Characteristic	Test Method	Specification
Scrap tire CRM gradation (% passing No. 8 sieve)	LP-10	100
High natural CRM gradation (% passing No. 10 sieve)	LP-10	100
Wire in CRM (% max.)	LP-10	0.01
Fabric in CRM (% max.)	LP-10	0.05
CRM particle length (inch max.) [a]	--	3/16
CRM specific gravity [a]	CT 208	1.1 – 1.2
Natural rubber content in high natural CRM (%) [a]	ASTM D 297	40.0 – 48.0

Note:
[a] Test at mix design and for Certificate of Compliance.

Only use CRM ground and granulated at ambient temperature. If steel and fiber are cryogenically separated, it must occur before grinding and granulating. Only use cryogenically produced CRM particles that can be ground or granulated and not pass through the grinder or granulator.

CRM must be dry, free-flowing particles that do not stick together. CRM must not cause foaming when combined with the asphalt binder and asphalt modifier. You may add calcium carbonate or talc up to 3 percent by weight of CRM.

Asphalt Rubber Binder Design and Profile

Submit in writing an asphalt rubber binder design and profile that complies with the asphalt rubber binder specifications. In the design, designate the asphalt, asphalt modifier, and CRM and their proportions. The profile is not a performance specification and only serves to indicate expected trends in asphalt rubber binder properties during binder production. The profile must include the same component sources for the asphalt rubber binder used.

Design the asphalt rubber binder from testing you perform for each quality characteristic and for the reaction temperatures expected during production. The 24-hour (1,440-minute) interaction period determines the design profile. At a minimum, mix asphalt rubber binder components, take samples, and perform and record the following tests:

Asphalt Rubber Binder Reaction Design Profile

Test	Minutes of Reaction [a]							Limits
	45	60	90	120	240	360	1440	
Cone penetration @ 77 °F, 0.10-mm (ASTM D 217)	X [b]				X		X	25 - 70
Resilience @ 77 °F, percent rebound (ASTM D 5329)	X				X		X	18 min.
Field softening point, °F (ASTM D 36)	X				X		X	125 - 165
Viscosity, centipoises (LP-11)	X	X	X	X	X	X	X	1,500 - 4,000

Notes:
[a] Six hours (360 minutes) after CRM addition, reduce the oven temperature to 275 °F for a period of 16 hours. After the 16-hour (1320 minutes) cool-down after CRM addition, reheat the binder to the reaction temperature expected during production for sampling and testing at 24 hours (1440 minutes).
[b] "X" denotes required testing

Asphalt Rubber Binder

After interacting for a minimum of 45 minutes, asphalt rubber binder must comply with:

Asphalt Rubber Binder

Quality Characteristic	Test for Quality Control or Acceptance	Test Method	Specification	
			Minimum	Maximum
Cone penetration @ 77 °F, 0.10-mm	Acceptance	ASTM D 217	25	70
Resilience @ 77 °F, percent rebound	Acceptance	ASTM D 5329	18	--
Field softening point, °F	Acceptance	ASTM D 36	125	165
Viscosity @ 375 °F, centipoises	Quality Control	LP-11	1,500	4,000

39-1.02E Aggregate

Aggregate must be clean and free from deleterious substances. Aggregate:

1. Retained on the No. 4 sieve is coarse
2. Passing the No. 4 sieve is fine
3. Added and passing the No. 30 sieve is supplemental fine, including:

   3.1. Hydrated lime
   3.2. Portland cement
   3.3. Fines from dust collectors

The special provisions specify the aggregate gradation for each HMA type.

The specified aggregate gradation is before the addition of asphalt binder and includes supplemental fines. The Engineer tests for aggregate grading under California Test 202, modified by California Test 105 if there is a difference in specific gravity of 0.2 or more between the coarse and fine parts of different aggregate blends.

Choose a sieve size target value (TV) within each target value limit presented in the aggregate gradation tables.

Aggregate Gradation
(Percentage Passing)
HMA Types A and B

3/4–inch HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
1"	100	—
3/4"	90 - 100	TV ±5
1/2"	70 - 90	TV ±6
No. 4	45 - 55	TV ±7
No. 8	32 - 40	TV ±5
No. 30	12 - 21	TV ±4
No. 200	2 - 7	TV ±2

1/2–inch HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/4"	100	—
1/2"	95 - 99	TV ±6
3/8"	75 - 95	TV ±6
No. 4	55 - 66	TV ±7
No. 8	38 - 49	TV ±5
No. 30	15 - 27	TV ±4
No. 200	2 - 8	TV ±2

3/8–inch HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
1/2"	100	—
3/8"	95 - 100	TV ±6
No. 4	58 - 72	TV ±7
No. 8	34 - 48	TV ±6
No. 30	18 - 32	TV ±5
No. 200	2 - 9	TV ±2

No. 4 HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/8"	100	—
No. 4	95 - 100	TV ±7
No. 8	72 - 77	TV ±7
No. 30	37 - 43	TV ±7
No. 200	2 - 12	TV ±4

Rubberized Hot Mix Asphalt - Gap Graded (RHMA-G)

3/4–inch RHMA-G

Sieve Sizes	Target Value Limits	Allowable Tolerance
1"	100	—
3/4"	95 - 100	TV ±5
1/2"	83 - 87	TV ±6
3/8"	65 - 70	TV ±6
No. 4	28 - 42	TV ±7
No. 8	14 - 22	TV ±5
No. 200	0 - 6	TV ±2

1/2–inch RHMA-G

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/4"	100	—
1/2"	90 - 100	TV ±6
3/8"	83 - 87	TV ±6
No. 4	28 - 42	TV ±7
No. 8	14 - 22	TV ±5
No. 200	0 - 6	TV ±2

Open Graded Friction Course (OGFC)

1–inch OGFC

Sieve Sizes	Target Value Limits	Allowable Tolerance
1 1/2"	100	—
1"	99 - 100	TV ±5
3/4"	85 - 96	TV ±5
1/2"	55 - 71	TV ±6
No. 4	10 - 25	TV ±7
No. 8	6 - 16	TV ±5
No. 200	1 - 6	TV ±2

1/2–inch OGFC

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/4"	100	—
1/2"	95 - 100	TV ±6
3/8"	78 - 89	TV ±6
No. 4	28 - 37	TV ±7
No. 8	7 - 18	TV ±5
No. 30	0 - 10	TV ±4
No. 200	0 - 3	TV ±2

3/8–inch OGFC

Sieve Sizes	Target Value Limits	Allowable Tolerance
1/2"	100	—
3/8"	90 - 100	TV ±6
No. 4	29 - 36	TV ±7
No. 8	7 - 18	TV ±6
No. 30	0 - 10	TV ±5
No. 200	0 - 3	TV ±2

Before the addition of asphalt binder and lime treatment, aggregate must comply with:

Aggregate Quality

Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Percent of crushed particles	CT 205				
Coarse aggregate (% min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (% min) (Passing No. 4 sieve and retained on No. 8 sieve.) One fractured face		70	20	70	90
Los Angeles Rattler (% max.)	CT 211				
Loss at 100 Rev.		12	--	12	12
Loss at 500 Rev.		45	50	40	40
Sand equivalent (min.) [a]	CT 217	47	42	47	--
Fine aggregate angularity (% min.) [b]	CT 234	45	45	45	--
Flat and elongated particles (% max. by weight @ 5:1)	CT 235	10	10	10	10

Notes:
[a] Reported value must be the average of 3 tests from a single sample.
[b] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

39-1.02F Reclaimed Asphalt Pavement

You may produce HMA using reclaimed asphalt pavement (RAP). HMA produced using RAP must comply with the specifications for HMA except aggregate quality specifications do not apply to RAP. You may substitute RAP aggregate for a part of the virgin aggregate in HMA in a quantity not exceeding 15.0 percent of the aggregate blend. Do not use RAP in OGFC and RHMA-G.

Assign the substitution rate of RAP aggregate for virgin aggregate with the job mix formula (JMF) submittal. The JMF must include the percent of RAP used. If you change your assigned RAP aggregate substitution rate by more than 5 percent (within the 15.0 percent limit), submit a new JMF.

Process RAP from asphalt concrete. You may process and stockpile RAP throughout the project's life. Prevent material contamination and segregation. Store RAP in stockpiles on smooth surfaces free of debris and organic material. Processed RAP stockpiles must consist only of homogeneous RAP.

39-1.03 HOT MIX ASPHALT MIX DESIGN REQUIREMENTS

39-1.03A General

A mix design consists of performing California Test 367 and laboratory procedures on combinations of aggregate gradations and asphalt binder contents to determine the optimum binder content (OBC) and HMA mixture qualities. If RAP is used, use Laboratory Procedure LP-9. The result of the mix design becomes the proposed JMF.

Use Form CEM-3512 to document aggregate quality and mix design data. Use Form CEM-3511 to present the JMF.

Laboratories testing aggregate qualities and preparing the mix design and JMF must be qualified under the Department's Independent Assurance Program. Take samples under California Test 125.

The Engineer reviews the aggregate qualities, mix design, and JMF and verifies and accepts the JMF.

You may change the JMF during production. Do not use the changed JMF until the Engineer accepts it. Except when adjusting the JMF in compliance with Section 39-1.03E, "Job Mix Formula Verification," perform a new mix design and submit in writing a new JMF submittal for changing any of the following:

1. Target asphalt binder percentage
2. Asphalt binder supplier
3. Asphalt rubber binder supplier
4. Component materials used in asphalt rubber binder or percentage of any component materials
5. Combined aggregate gradation
6. Aggregate sources
7. Substitution rate for RAP aggregate of more than 5 percent
8. Any material in the JMF

For OGFC, submit in writing a complete JMF submittal except asphalt binder content. The Engineer determines the asphalt binder content under California Test 368 within 20 days of your complete JMF submittal and provides you a Form CEM-3513.

39-1.03B Hot Mix Asphalt Mix Design

Perform a mix design that produces HMA in compliance with:

Hot Mix Asphalt Mix Design Requirements

Quality Characteristic	Test Method	HMA Type		
		A	B	RHMA-G
Air voids content (%)	CT 367[a]	4.0	4.0	Special Provisions
Voids in mineral aggregate (% min.)	LP-2			
No. 4 grading		17.0	17.0	--
3/8" grading		15.0	15.0	--
1/2" grading		14.0	14.0	18.0 – 23.0[b]
3/4" grading		13.0	13.0	18.0 – 23.0[b]
Voids filled with asphalt (%)	LP-3			
No. 4 grading		76.0 – 80.0	76.0 – 80.0	Note d
3/8" grading		73.0 – 76.0	73.0 – 76.0	
1/2" grading		65.0 – 75.0	65.0 – 75.0	
3/4" grading		65.0 – 75.0	65.0 – 75.0	
Dust proportion	LP-4			
No. 4 and 3/8" gradings		0.9 – 2.0	0.9 – 2.0	Note d
1/2" and 3/4" gradings		0.6 – 1.3	0.6 – 1.3	
Stabilometer value (min.) [c]	CT 366			
No. 4 and 3/8" gradings		30	30	--
1/2" and 3/4" gradings		37	35	23

Notes:

[a] Calculate the air voids content of each specimen using California Test 309 and Lab Procedure LP-1. Modify California Test 367, Paragraph C5, to use the exact air voids content specified in the selection of OBC.
[b] Voids in mineral aggregate for RHMA-G must be within this range.
[c] Modify California Test 304, Part 2.B.2.c: "After compaction in the compactor, cool to 140 °± 5 °F by allowing the briquettes to cool at room temperature for 0.5-hour, then place the briquettes in the oven at 140 °F for a minimum of 2 hours and not more than 3 hours."
[d] Report this value in the JMF submittal.

For stability and air voids content, prepare 3 briquettes at the OBC and test for compliance. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 8 points. The average air void content may vary from the specified air void content by ±0.5 percent.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use the same briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

39-1.03C Job Mix Formula Submittal

Each JMF submittal must consist of:

1. Proposed JMF on Form CEM-3511
2. Mix design documentation on Form CEM-3512 dated within 12 months of submittal
3. JMF verification on Form CEM-3513, if applicable
4. JMF renewal on Form CEM-3514, if applicable
5. Materials Safety Data Sheets (MSDS) for:

    5.1. Asphalt binder
    5.2. Base asphalt binder used in asphalt rubber binder
    5.3. CRM and asphalt modifier used in asphalt rubber binder
    5.4. Blended asphalt rubber binder mixture

5.5. Supplemental fine aggregate except fines from dust collectors
5.6. Antistrip additives

If the Engineer requests in writing, sample the following materials in the presence of the Engineer and place in labeled containers weighing no more than 50 pounds each:

1. Coarse, fine, and supplemental fine aggregate from stockpiles, cold feed belts, or hot bins. Samples must include at least 120 pounds for each coarse aggregate, 80 pounds for each fine aggregate, and 10 pounds for each type of supplemental fines. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
2. RAP from stockpiles or RAP system. Samples must be at least 60 pounds.
3. Asphalt binder from the binder supplier. Samples must be in two 1-quart cylindrical shaped cans with open top and friction lids.
4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-quart cylindrical shaped cans with open top and friction lids.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate and RAP, split the samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

39-1.03D Job Mix Formula Review

The Engineer reviews each mix design and proposed JMF within 5 business days from the complete JMF submittal. The review consists of reviewing the mix design procedures and comparing the proposed JMF with the specifications.

The Engineer may verify aggregate qualities during this review period.

39-1.03E Job Mix Formula Verification

If you cannot submit a Department-verified JMF on Form CEM-3513 dated within 12 months before HMA production, the Engineer verifies the JMF.

Based on your testing and production experience, you may submit on Form CEM-3511 an adjusted JMF before the Engineer's verification testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to ±0.6 percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

For HMA Type A, Type B, and RHMA-G, the Engineer verifies the JMF from samples taken from HMA produced by the plant to be used. Notify the Engineer in writing at least 2 business days before sampling materials.

In the Engineer's presence and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from cold feed belts or hot bins. Sample RAP from the RAP system. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample from any of the following locations:

1. The plant
2. A truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

You may sample from a different project including a non-Department project if you make arrangements for the Engineer to be present during sampling.

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and use 1 part for your testing.

The Engineer verifies each proposed JMF within 20 days of receiving all verification samples and the JMF submittal has been accepted. If you request in writing, the Engineer verifies RHMA-G quality requirements within 3 business days of sampling. Verification is testing for compliance with the specifications for:

1. Aggregate quality
2. Aggregate gradation (JMF TV ± tolerance)
3. Asphalt binder content (JMF TV ± tolerance)
4. HMA quality specified in the table Hot Mix Asphalt Mix Design Requirements except:

    4.1. Air voids content (design value ± 2.0 percent)
    4.2. Voids filled with asphalt (report only if an adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC)
    4.3. Dust proportion (report only if an adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC)

The Engineer prepares 3 briquettes from a single split sample. To verify the JMF for stability and air voids content, the Engineer tests the 3 briquettes and reports the average of 3 tests. The Engineer prepares new briquettes if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

If the Engineer verifies the JMF, the Engineer provides you a Form CEM-3513.

If the Engineer's tests on plant-produced samples do not verify the JMF, the Engineer notifies you in writing and you must submit a new JMF submittal or submit an adjusted JMF based on your testing. JMF adjustments may include a change in the:

1. Asphalt binder content target value up to ±0.6 percent from the optimum binder content value submitted on Form CEM-3512 except do not adjust the target value for asphalt rubber binder for RHMA-G below 7.0 percent
2. Aggregate gradation target values within the target value limits specified in the aggregate gradation tables

You may adjust the JMF only once due to a failed verification test. An adjusted JMF requires a new Form CEM-3511 and verification of a plant-produced sample.

A verified JMF is valid for 12 months.

For each HMA type and aggregate size specified, the Engineer verifies at the State's expense up to 2 proposed JMF including a JMF adjusted after verification failure. The Engineer deducts $3,000 from payments for each verification exceeding this limit. This deduction does not apply to verifications initiated by the Engineer or JMF renewal.

39-1.03F Job Mix Formula Renewal

You may request a JMF renewal by submitting the following:

1. Proposed JMF on Form CEM-3511
2. A previously verified JMF documented on Form CEM-3513 dated within 12 months
3. Mix design documentation on Form CEM-3512 used for the previously verified JMF

If the Engineer requests in writing, sample the following materials in the presence of the Engineer and place in labeled containers weighing no more than 50 pounds each:

1. Coarse, fine, and supplemental fine aggregate from stockpiles, cold feed belts, or hot bins. Samples must include at least 120 pounds for each coarse aggregate, 80 pounds for each fine aggregate, and 10 pounds for each type of supplemental fines. The Department combines these aggregate samples to comply with the JMF target values submitted on Form CEM-3511.
2. RAP from stockpiles or RAP system. Samples must be at least 60 pounds.
3. Asphalt binder from the binder supplier. Samples must be in two 1-quart cylindrical shaped cans with open top and friction lids.

4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-quart cylindrical shaped cans with open top and friction lids.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate and RAP, split samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

The Engineer may verify aggregate qualities during this review period.

Notify the Engineer in writing at least 2 business days before sampling materials. For aggregate, RAP, and HMA, split the samples into at least 4 parts. Submit 3 parts to the Engineer and use 1 part for your testing.

The Engineer verifies the JMF renewal submittal under Section 39-1.03E, "Job Mix Formula Verification," except:

1. The Engineer retains samples until you provide test results for your part on Form CEM-3514.
2. The Engineer tests samples of materials obtained from the HMA production unit after you submit test results that comply with the specifications for the quality characteristics under Section 39-1.03E, "Job Mix Formula Verification."
3. The Engineer verifies each proposed JMF renewal within 20 days of receiving verification samples.
4. You may not adjust the JMF due to a failed verification.
5. For each HMA type and aggregate gradation specified, the Engineer verifies at the State's expense 1 proposed JMF renewal within a 12-month period.

The most recent aggregate quality test results within the past 12 months may be used for verification of JMF renewal or the Engineer may perform aggregate quality tests for verification of JMF renewal.

If the Engineer verifies the JMF renewal, the Engineer provides you a Form CEM-3513.

39-1.03G Job Mix Formula Modification

For an accepted JMF, you may change binder source one time during production.

Submit your modified JMF request a minimum of 3 business days before production. Each modified JMF submittal must consist of:

1. Proposed modified JMF on Form CEM-3511.
2. Mix design records on Form CEM-3512 for the accepted JMF to be modified.
3. JMF verification on Form CEM-3513 for the accepted JMF to be modified.
4. Quality characteristics test results for the modified JMF as specified in section 39-1.03B. Perform tests at the mix design OBC as shown on Form CEM-3512.
5. If required, California Test 371 test results for the modified JMF.

With an accepted modified JMF submittal, the Engineer verifies each modified JMF within 5 business days of receiving all verification samples. If California Test 371 is required, the Engineer tests for California Test 371 within 10 days of receiving verification samples.

The Engineer verifies the modified JMF after the modified JMF HMA is placed on the project and verification samples are taken within the first 750 tons following sampling requirements in Section 39-1.03E, "Job Mix Formula Verification." The Engineer tests verification samples for compliance with:

1. Stability as shown in the table titled "Hot Mix Asphalt Mix Design Requirements"
2. Air void content at design value ±2.0 percent
3. Voids in mineral aggregate as shown in the table titled "Hot Mix Asphalt Mix Design Requirements"
4. Voids filled with asphalt if an adjustment for asphalt binder content TV is more than ±0.3 percent from the original OBC shown on Form CEM-3512.
5. Dust proportion if an adjustment for asphalt binder content TV is more than ±0.3 percent from OBC shown on Form CEM-3512.

If the modified JMF is verified, the Engineer revises your Form CEM-3513 to include the new binder source. Your revised Form CEM-3513 will have the same expiration date as the original Form CEM-3513 for the accepted JMF that is modified.

If a modified JMF is not verified, stop production and any HMA placed using the modified JMF is rejected.

The Engineer deducts $2,000 from payments for each modified JMF verification. The Engineer deducts an additional $2,000 from payments for each modified JMF verification that requires California Test 371.

39-1.03H Job Mix Formula Acceptance

You may start HMA production if:

1. The Engineer's review of the JMF shows compliance with the specifications.
2. The Department has verified the JMF within 12 months before HMA production.
3. The Engineer accepts the verified JMF.

39-1.04 CONTRACTOR QUALITY CONTROL

39-1.04A General

Establish, maintain, and change a quality control system to ensure materials and work comply with the specifications. Submit quality control test results to the Engineer within 3 business days of a request except when QC / QA is specified.

You must identify the HMA sampling location in your Quality Control Plan. During production, take samples under California Test 125. You may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

39-1.04B Prepaving Conference

Meet with the Engineer at a prepaving conference at a mutually agreed time and place. Discuss methods of performing the production and paving work.

39-1.04C Asphalt Rubber Binder

Take asphalt rubber binder samples from the feed line connecting the asphalt rubber binder tank to the HMA plant. Sample and test asphalt rubber binder under Laboratory Procedure LP-11.

Test asphalt rubber binder for compliance with the viscosity specifications in Section 39-1.02, "Materials." During asphalt rubber binder production and HMA production using asphalt rubber binder, measure viscosity every hour with not less than 1 reading for each asphalt rubber binder batch. Log measurements with corresponding time and asphalt rubber binder temperature. Submit the log daily in writing.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance." With the Certificate of Compliance, submit test results in writing for CRM and asphalt modifier with each truckload delivered to the HMA plant. A Certificate of Compliance for asphalt modifier must not represent more than 5,000 pounds. Use an AASHTO-certified laboratory for testing.

Sample and test gradation and wire and fabric content of CRM once per 10,000 pounds of scrap tire CRM and once per 3,400 pounds of high natural CRM. Sample and test scrap tire CRM and high natural CRM separately.

Submit certified weight slips in writing for the CRM and asphalt modifier furnished.

39-1.04D Aggregate

Determine the aggregate moisture content and RAP moisture content in continuous mixing plants at least twice a day during production and adjust the plant controller. Determine the RAP moisture content in batch mixing plants at least twice a day during production and adjust the plant controller.

39-1.04E Reclaimed Asphalt Pavement

Perform RAP quality control testing each day.

Sample RAP once daily and determine the RAP aggregate gradation under Laboratory Procedure LP-9 and submit the results to the Engineer in writing with the combined aggregate gradation.

39-1.04F Density Cores

To determine density for Standard and QC / QA projects, take 4-inch or 6-inch diameter density cores at least once every 5 business days. Take 1 density core for every 250 tons of HMA from random locations the Engineer designates. Take density cores in the Engineer's presence and backfill and compact holes with material authorized by the Engineer. Before submitting a density core to the Engineer, mark it with the density core's location and place it in a protective container.

If a density core is damaged, replace it with a density core taken within 1 foot longitudinally from the original density core. Relocate any density core located within 1 foot of a rumble strip to 1 foot transversely away from the rumble strip.

39-1.04G Briquettes

Prepare 3 briquettes for each stability and air voids content determination. Report the average of 3 tests. Prepare new briquettes and test if the range of stability for the 3 briquettes is more than 12 points.

You may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If you use these briquettes and tests using bulk specific gravity fail, you may prepare 3 new briquettes and determine a new bulk specific gravity.

39-1.05 ENGINEER'S ACCEPTANCE

The Engineer's acceptance of HMA is specified in the sections for each HMA construction process.

The Engineer samples materials for testing under California Test 125 and the applicable test method except samples may be taken from:

1. The plant from:

    1.1. A truck
    1.2. An automatic sampling device

2. The mat behind the paver

Sampling must be independent of Contractor quality control, statistically-based, and random.

If you request, the Engineer splits samples and provides you with a part.

The Engineer accepts HMA based on:

1. Accepted JMF
2. Accepted QCP for Standard and QC / QA
3. Compliance with the HMA Acceptance tables
4. Acceptance of a lot for QC / QA
5. Visual inspection

The Engineer prepares 3 briquettes for each stability and air voids content determination. The Engineer reports the average of 3 tests. The Engineer prepares new briquettes and test if the range of stability for the 3 briquettes is more than 8 points.

The Engineer may use the briquettes used for stability testing to determine bulk specific gravity under CT 308. If the Engineer uses the same briquettes and the tests using bulk specific gravity fail, the Engineer prepares 3 new briquettes and determines a new bulk specific gravity.

39-1.06 DISPUTE RESOLUTION

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer in writing within 5 business days of receiving a test result if you dispute the test result.

If you or the Engineer dispute each other's test results, submit written quality control test results and copies of paperwork including worksheets used to determine the disputed test results to the Engineer. An Independent Third Party (ITP) performs referee testing. Before the ITP participates in a dispute resolution, the ITP must be accredited under the Department's Independent Assurance Program. The ITP must be independent of the project. By mutual agreement, the ITP is chosen from:

1. A Department laboratory
2. A Department laboratory in a district or region not in the district or region the project is located
3. The Transportation Laboratory
4. A laboratory not currently employed by you or your HMA producer

If split quality control or acceptance samples are not available, the ITP uses any available material representing the disputed HMA for evaluation.

39-1.07 PRODUCTION START-UP EVALUATION

The Engineer evaluates HMA production and placement at production start-up.

Within the first 750 tons produced on the first day of HMA production, in the Engineer's presence and from the same production run, take samples of:

1. Aggregate
2. Asphalt binder
3. RAP
4. HMA

Sample aggregate from cold feed belts or hot bins. Take RAP samples from the RAP system. Sample HMA under California Test 125 except if you request in writing and the Engineer approves, you may sample HMA from:

1. The plant
2. The truck
3. A windrow
4. The paver hopper
5. The mat behind the paver

For aggregate, RAP, and HMA, split the samples into at least 4 parts and label their containers. Submit 3 split parts to the Engineer and keep 1 part.

For Standard and QC / QA projects, you and the Engineer must test the split samples and report test results in writing within 3 business days of sampling. If you proceed before receipt of the test results, the Engineer may consider the HMA placed to be represented by these test results.

For Standard and QC / QA projects, take 4-inch or 6-inch diameter density cores within the first 750 tons on the first day of HMA production. For each density core, the Engineer reports the bulk specific gravity determined under California Test 308, Method A in addition to the percent of maximum theoretical density. You may test for in-place density at the density core locations and include them in your production tests for percent of maximum theoretical density.

39-1.08 PRODUCTION

39-1.08A General

Produce HMA in a batch mixing plant or a continuous mixing plant. Proportion aggregate by hot or cold feed control.

HMA plants must be Department-qualified. Before production, the HMA plant must have a current qualification under the Department's Materials Plant Quality Program.

During production, you may adjust:

1. Hot or cold feed proportion controls for virgin aggregate and RAP
2. The set point for asphalt binder content

39-1.08B Mixing

Mix HMA ingredients into a homogeneous mixture of coated aggregates.

Asphalt binder must be between 275 °F and 375 °F when mixed with aggregate.

Asphalt rubber binder must be between 375 °F and 425 °F when mixed with aggregate.

When mixed with asphalt binder, aggregate must not be more than 325 °F except aggregate for OGFC with unmodified asphalt binder must be not more than 275 °F. Aggregate temperature specifications do not apply when you use RAP.

HMA with or without RAP must not be more than 325 °F.

39-1.08C Asphalt Rubber Binder

Deliver scrap tire CRM and high natural CRM in separate bags.

Either proportion and mix asphalt binder, asphalt modifier, and CRM simultaneously or premix the asphalt binder and asphalt modifier before adding CRM. If you premix asphalt binder and asphalt modifier, asphalt binder must be from 375 to 425 degrees F when you add the asphalt modifier. Mix them for at least 20 minutes. When you add CRM, the asphalt binder and asphalt modifier must be between 375 °F and 425 °F.

Do not use asphalt rubber binder during the first 45 minutes of the reaction period. During this period, the asphalt rubber binder mixture must be between 375 °F and the lower of 425 °F or 25 °F below the asphalt binder's flash point indicated in the MSDS.

If any asphalt rubber binder is not used within 4 hours after the reaction period, discontinue heating. If the asphalt rubber binder drops below 375 °F, reheat before use. If you add more scrap tire CRM to the reheated asphalt rubber binder, the binder must undergo a 45-minute reaction period. The added scrap tire CRM must not exceed 10 percent of the total asphalt rubber binder weight. Reheated and reacted asphalt rubber binder must comply with the viscosity specifications for asphalt rubber binder in Section 39-1.02, "Materials." Do not reheat asphalt rubber binder more than twice.

39-1.09 SUBGRADE, TACK COAT, AND GEOSYNTHETIC PAVEMENT INTERLAYER

39-1.09A General

Prepare subgrade or apply tack coat to surfaces receiving HMA. If specified, place geosynthetic pavement interlayer over a coat of asphalt binder.

39-1.09B Subgrade

Subgrade to receive HMA must comply with the compaction and elevation tolerance specifications in the sections for the material involved. Subgrade must be free of loose and extraneous material. If HMA is paved on existing base or pavement, remove loose paving particles, dirt, and other extraneous material by any means including flushing and sweeping.

39-1.09C Tack Coat

Apply tack coat:

1. To existing pavement including planed surfaces
2. Between HMA layers
3. To vertical surfaces of:

    3.1. Curbs
    3.2. Gutters
    3.3. Construction joints

Before placing HMA, apply tack coat in 1 application at the minimum residual rate specified for the condition of the underlying surface:

Tack Coat Application Rates for HMA Type A, Type B, and RHMA-G

HMA over:	Minimum Residual Rates (gallons per square yard)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA (between layers)	0.02	0.03	0.02
PCC and existing HMA (AC) surfaces	0.03	0.04	0.03
Planed PCC and HMA (AC) surfaces	0.05	0.06	0.04

Tack Coat Application Rates for OGFC

OGFC over:	Minimum Residual Rates (gallons per square yard)		
	CSS1/CSS1h, SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	CRS1/CRS2, RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 and PMRS2h/PMCRS2h Asphaltic Emulsion
New HMA	0.03	0.04	0.03
PCC and existing HMA (AC) surfaces	0.05	0.06	0.04
Planed PCC and HMA (AC) surfaces	0.06	0.07	0.05

If you dilute asphaltic emulsion, mix until homogeneous before application.

Apply to vertical surfaces with a residual tack coat rate that will thoroughly coat the vertical face without running off.

If you request in writing and the Engineer authorizes, you may:

1. Change tack coat rates
2. Omit tack coat between layers of new HMA during the same work shift if:

    2.1. No dust, dirt, or extraneous material is present
    2.2. The surface is at least 140 °F

Immediately in advance of placing HMA, apply additional tack coat to damaged areas or where loose or extraneous material is removed.

Close areas receiving tack coat to traffic. Do not track tack coat onto pavement surfaces beyond the job site.

Asphalt binder tack coat must be between 285 °F and 350 °F when applied.

39-1.09D Geosynthetic Pavement Interlayer

Place geosynthetic pavement interlayer in compliance with the manufacturer's recommendations.

Before placing the geosynthetic pavement interlayer and asphalt binder:

1. Repair cracks 1/4 inch and wider, spalls, and holes in the pavement. The State pays for this repair work under Section 4-1.03D, "Extra Work."
2. Clean the pavement of loose and extraneous material.

Immediately before placing the interlayer, apply 0.25 gallon ± 0.03 gallon of asphalt binder per square yard of interlayer or until the fabric is saturated. Apply asphalt binder the width of the geosynthetic pavement interlayer plus 3 inches on each side. At interlayer overlaps, apply asphalt binder on the lower interlayer the same overlap distance as the upper interlayer.

Asphalt binder must be from 285 °F to 350 °F and below the minimum melting point of the geosynthetic pavement interlayer when applied.

Align and place the interlayer with no overlapping wrinkles, except a wrinkle that overlaps may remain if it is less than 1/2 inch thick. If the overlapping wrinkle is more than 1/2 inch thick, cut the wrinkle out and overlap the interlayer no more than 2 inches.

The minimum HMA thickness over the interlayer must be 0.12 foot thick including conform tapers. Do not place the interlayer on a wet or frozen surface.

Overlap the interlayer borders between 2 inches and 4 inches. In the direction of paving, overlap the following roll with the preceding roll at any break.

You may use rolling equipment to correct distortions or wrinkles in the interlayer.

If asphalt binder tracked onto the interlayer or brought to the surface by construction equipment causes interlayer displacement, cover it with a small quantity of HMA.

Before placing HMA on the interlayer, do not expose the interlayer to:

1. Traffic except for crossings under traffic control and only after you place a small HMA quantity
2. Sharp turns from construction equipment
3. Damaging elements

Pave HMA on the interlayer during the same work shift.

39-1.10 SPREADING AND COMPACTING EQUIPMENT

Paving equipment for spreading must be:

1. Self-propelled
2. Mechanical
3. Equipped with a screed or strike-off assembly that can distribute HMA the full width of a traffic lane
4. Equipped with a full-width compacting device
5. Equipped with automatic screed controls and sensing devices that control the thickness, longitudinal grade, and transverse screed slope

Install and maintain grade and slope references.

The screed must produce a uniform HMA surface texture without tearing, shoving, or gouging.

The paver must not leave marks such as ridges and indentations unless you can eliminate them by rolling.

Rollers must be equipped with a system that prevents HMA from sticking to the wheels. You may use a parting agent that does not damage the HMA or impede the bonding of layers.

In areas inaccessible to spreading and compacting equipment:

1. Spread the HMA by any means to obtain the specified lines, grades and cross sections.
2. Use a pneumatic tamper, plate compactor, or equivalent to achieve thorough compaction.

39-1.11 TRANSPORTING, SPREADING, AND COMPACTING

Do not pave HMA on a wet pavement or frozen surface.

You may deposit HMA in a windrow and load it in the paver if:

1. Paver is equipped with a hopper that automatically feeds the screed
2. Loading equipment can pick up the windrowed material and deposit it in the paver hopper without damaging base material
3. Activities for deposit, pick-up, loading, and paving are continuous
4. HMA temperature in the windrow does not fall below 260 °F

You may pave HMA in 1 or more layers on areas less than 5 feet wide and outside the traveled way including shoulders. You may use mechanical equipment other than a paver for these areas. The equipment must produce a uniform smoothness and texture.

HMA handled, spread, or windrowed must not stain the finished surface of any improvement including pavement.

Do not use petroleum products such as kerosene or diesel fuel to release HMA from trucks, spreaders, or compactors.

HMA must be free of:

1. Segregation
2. Coarse or fine aggregate pockets
3. Hardened lumps

Longitudinal joints in the top layer must match specified lane edges. Alternate longitudinal joint offsets in lower layers at least 0.5 foot from each side of the specified lane edges. You may request in writing other longitudinal joint placement patterns.

Until the adjoining through lane's top layer has been paved, do not pave the top layer of:

1. Shoulders
2. Tapers
3. Transitions
4. Road connections
5. Driveways
6. Curve widenings
7. Chain control lanes

8. Turnouts
9. Turn pockets

If the number of lanes change, pave each through lane's top layer before paving a tapering lane's top layer. Simultaneous to paving a through lane's top layer, you may pave an adjoining area's top layer including shoulders. Do not operate spreading equipment on any area's top layer until completing final compaction.

If HMA (leveling) is specified, fill and level irregularities and ruts with HMA before spreading HMA over base, existing surfaces, or bridge decks. You may use mechanical equipment other than a paver for these areas. The equipment must produce a uniform smoothness and texture. HMA used to change an existing surface's cross slope or profile is not HMA (leveling).

If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. If placing HMA against the edge of a longitudinal or transverse construction joint and the joint is damaged or not placed to a neat line, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material without damaging the surface remaining in place. Repair or remove and replace damaged pavement at your expense.

Rolling must leave the completed surface compacted and smooth without tearing, cracking, or shoving. Complete finish rolling activities before the pavement surface temperature is:

1. Below 150 °F for HMA with unmodified binder
2. Below 140 °F for HMA with modified binder
3. Below 200 °F for RHMA-G

If a vibratory roller is used as a finish roller, turn the vibrator off.

Do not use a pneumatic tired roller to compact RHMA-G.

For Standard and QC/QA, if a 3/4-inch aggregate grading is specified, you may use a 1/2-inch aggregate grading if the specified total paved thickness is at least 0.15 foot and less than 0.20 foot thick.

Spread and compact HMA under Section 39-3.03, "Spreading and Compacting Equipment," and Section 39-3.04, "Transporting, Spreading, and Compacting," for any of the following:

1. Specified paved thickness is less than 0.15 foot.
2. Specified paved thickness is less than 0.20 foot and a 3/4-inch aggregate grading is specified and used.
3. You spread and compact at:

    3.1. Asphalt concrete surfacing replacement areas
    3.2. Leveling courses
    3.3. Areas the Engineer determines conventional compaction and compaction measurement methods are impeded

Do not open new HMA pavement to public traffic until its mid-depth temperature is below 160 °F.

If you request in writing and the Engineer authorizes, you may cool HMA Type A and Type B with water when rolling activities are complete. Apply water under Section 17, "Watering."

Spread sand at a rate between 1 pound and 2 pounds per square yard on new RHMA-G, RHMA-O, and RHMA-O-HB pavement when finish rolling is complete. Sand must be free of clay or organic matter. Sand must comply with Section 90-3.03, "Fine Aggregate Grading." Keep traffic off the pavement until spreading sand is complete.

39-1.12 SMOOTHNESS

39-1.12A General

Determine HMA smoothness with a profilograph and a straightedge.

Smoothness specifications do not apply to OGFC placed on existing pavement not constructed under the same project.

If portland cement concrete is placed on HMA:

1. Cold plane the HMA finished surface to within specified tolerances if it is higher than the grade specified by the Engineer.
2. Remove and replace HMA if the finished surface is lower than 0.05 foot below the grade specified by the Engineer.

39-1.12B Straightedge

The HMA pavement top layer must not vary from the lower edge of a 12-foot long straightedge:

1. More than 0.01 foot when the straight edge is laid parallel with the centerline
2. More than 0.02 foot when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
3. More than 0.02 foot when the straightedge is laid within 24 feet of a pavement conform

39-1.12C Profilograph

Under California Test 526, determine the zero (null) blanking band Profile Index (PI_0) and must-grinds on the top layer of HMA Type A, Type B, and RHMA-G pavement. Take 2 profiles within each traffic lane, 3 feet from and parallel with the edge of each lane.

A must-grind is a deviation of 0.3 inch or more in a length of 25 feet. You must correct must-grinds.

For OGFC, only determine must-grinds when placed over HMA constructed under the same project. The top layer of the underlying HMA must comply with the smoothness specifications before placing OGFC.

Profile pavement in the Engineer's presence. Choose the time of profiling.

On tangents and horizontal curves with a centerline radius of curvature 2,000 feet or more, the PI_0 must be at most 2.5 inches per 0.1-mile section.

On horizontal curves with a centerline radius of curvature between 1,000 feet and 2,000 feet including pavement within the superelevation transitions, the PI_0 must be at most 5 inches per 0.1-mile section.

Before the Engineer accepts HMA pavement for smoothness, submit written final profilograms.

Submit 1 electronic copy of profile information in Microsoft Excel and 1 electronic copy of longitudinal pavement profiles in ".erd" format or other ProVAL compatible format to the Engineer and to:

Smoothness@dot.ca.gov

The following HMA pavement areas do not require a PI_0. You must measure these areas with a 12-foot straightedge and determine must-grinds with a profilograph:

1. New HMA with a total thickness less than 0.25 foot
2. HMA sections of city or county streets and roads, turn lanes and collector lanes that are less than 1,500 feet in length

The following HMA pavement areas do not require a PI_0. You must measure these areas with a 12-foot straightedge:

1. Horizontal curves with a centerline radius of curvature less than 1,000 feet including pavement within the superelevation transitions of those curves
2. Within 12 feet of a transverse joint separating the pavement from:

    2.1. Existing pavement not constructed under the same project
    2.2. A bridge deck or approach slab

3. Exit ramp termini, truck weigh stations, and weigh-in-motion areas
4. If steep grades and superelevation rates greater than 6 percent are present on:

    4.1. Ramps
    4.2. Connectors

5. Turn lanes
6. Areas within 15 feet of manholes or drainage transitions
7. Acceleration and deceleration lanes for at-grade intersections
8. Shoulders and miscellaneous areas
9. HMA pavement within 3 feet from and parallel to the construction joints formed between curbs, gutters, or existing pavement

39-1.12D Smoothness Correction

If the top layer of HMA Type A, Type B, or RHMA-G pavement does not comply with the smoothness specifications, grind the pavement to within tolerances, remove and replace it, or place a layer of HMA. The Engineer must authorize your choice of correction before the work begins.

Remove and replace the areas of OGFC not in compliance with the must-grind and straightedge specifications, except you may grind OGFC for correcting smoothness:

1. At a transverse joint separating the pavement from pavement not constructed under the same project
2. Within 12 feet of a transverse joint separating the pavement from a bridge deck or approach slab

Corrected HMA pavement areas must be uniform rectangles with edges:

1. Parallel to the nearest HMA pavement edge or lane line
2. Perpendicular to the pavement centerline

Measure the corrected HMA pavement surface with a profilograph and a 12-foot straightedge and correct the pavement to within specified tolerances. If a must-grind area or straightedged pavement cannot be corrected to within specified tolerances, remove and replace the pavement.

On ground areas not overlaid with OGFC, apply fog seal coat under Section 37-1, "Seal Coats."

39-1.13 MISCELLANEOUS AREAS AND DIKES

Miscellaneous areas are outside the traveled way and include:

1. Median areas not including inside shoulders
2. Island areas
3. Sidewalks
4. Gutters
5. Gutter flares
6. Ditches
7. Overside drains
8. Aprons at the ends of drainage structures

Spread miscellaneous areas in 1 layer and compact to the specified lines and grades.

For miscellaneous areas and dikes:

1. Do not submit a JMF.
2. Choose the 3/8-inch or 1/2-inch HMA Type A and Type B aggregate gradations.
3. Minimum asphalt binder content must be 6.8 percent for 3/8-inch aggregate and 6.0 percent for 1/2-inch aggregate. If you request in writing and the Engineer authorizes, you may reduce the minimum asphalt binder content.
4. Choose asphalt binder Grade PG 70-10 or the same grade specified for HMA.

39-2 STANDARD

39-2.01 DESCRIPTION

If HMA is specified as Standard, construct it under Section 39-1, "General," this Section 39-2, "Standard," and Section 39-5, "Measurement and Payment."

39-2.02 CONTRACTOR QUALITY CONTROL

39-2.02A Quality Control Plan

Establish, implement, and maintain a Quality Control Plan (QCP) for HMA. The QCP must describe the organization and procedures you will use to:

1. Control the quality characteristics
2. Determine when corrective actions are needed (action limits)
3. Implement corrective actions

When you submit the proposed JMF, submit the written QCP. You and the Engineer must discuss the QCP during the prepaving conference.

The QCP must address the elements affecting HMA quality including:

1. Aggregate
2. Asphalt binder
3. Additives
4. Production
5. Paving

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

39-2.02B Quality Control Testing

Perform sampling and testing at the specified frequency for the following quality characteristics:

Minimum Quality Control – Standard

Quality Characteristic	Test Method	Minimum Sampling and Testing Frequency	HMA Type			
			A	B	RHMA-G	OGFC
Aggregate gradation[a]	CT 202	1 per 750 tons and any remaining part at the end of the project	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]
Sand equivalent (min.) [c]	CT 217		47	42	47	--
Asphalt binder content (%)	CT 379 or 382		JMF ± 0.45	JMF ± 0.45	JMF ± 0.50	JMF ± 0.50
HMA moisture content (%, max.)	CT 226 or CT 370	1 per 2,500 tons but not less than 1 per paving day	1.0	1.0	1.0	1.0
Field compaction, (%, max. theoretical density) [d,e]	Quality control plan	2 per business day (min.)	91 - 97	91 - 97	91 - 97	--
Stabilometer value (min.) [c, f] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	CT 366	One per 4,000 tons or 2 per 5 business days, which-ever is more	 30 37	 30 35	 -- 23	 -- --
Air voids content (%) [c, g]	CT 367		4 ± 2	4 ± 2	Specification ± 2	--
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants [h]	CT 226 or CT 370	2 per day during production	--	--	--	--
Percent of crushed particles coarse aggregate (%, min.) One fractured face Two fractured faces Fine aggregate (%, min) (Passing No. 4 sieve and retained on No. 8 sieve.) One fractured face	CT 205	As necessary and designat-ed in the QCP. At least once per project	 90 75 70	 25 -- 20	 -- 90 70	 90 75 90
Los Angeles Rattler (%, max.) Loss at 100 rev. Loss at 500 rev.	CT 211		 12 45	 -- 50	 12 40	 12 40

Flat and elongated particles (%, max. by weight @ 5:1)	CT 235		Report only	Report only	Report only	Report only
Fine aggregate angularity (%, min.)[i]	CT 234		45	45	45	--
Voids filled with asphalt (%)[j] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	LP-3		 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	 76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	Report only	--
Voids in mineral aggregate (% min.)[j] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	LP-2		 17.0 15.0 14.0 13.0	 17.0 15.0 14.0 13.0	 -- -- 18.0 – 23.0 [k] 18.0 – 23.0 [k]	--
Dust proportion[j] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	LP-4		 0.9 – 2.0 0.6 – 1.3	 0.9 – 2.0 0.6 – 1.3	Report only	--
Smoothness	Section 39-1.12	--	12-foot straightedge, must-grind, and PI_0	12-foot straightedge, must-grind, and PI_0	12-foot straightedge, must-grind, and PI_0	12-foot straightedge and must-grind
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D	Section 39-1.04C	--	--	1,500 – 4,000	1,500 – 4,000
Asphalt modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D
Crumb rubber modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D

Notes:

[a] Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

[b] The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

[c] Report the average of 3 tests from a single split sample.

[d] Determine field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, No. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[e] To determine field compaction use:

1. In-place density measurements using the method specified in your QC.
2. California Test 309 to determine maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[f] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 140 °F ± 5 °F by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 140 °F for a minimum of 2 hours and not more than 3 hours."

[g] Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

[h] For adjusting the plant controller at the HMA plant.

[i] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

[j] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.

[k] Voids in mineral aggregate for RHMA-G must be within this range.

For any single quality characteristic except smoothness, if 2 consecutive quality control test results do not comply with the action limits or specifications:

1. Stop production.
2. Notify the Engineer in writing.
3. Take corrective action.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-2.03 ENGINEER'S ACCEPTANCE

39-2.03A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance - Standard

Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Aggregate gradation [a]	CT 202	JMF ± Tolerance [c]	JMF ± Tolerance [c]	JMF ± Tolerance [c]	JMF ± Tolerance [c]
Sieve / 3/4" / 1/2" / 3/8"					
1/2" / X [b] /					
3/8" /	X				
No. 4 /		X			
No. 8 / X	X	X			
No. 200 / X	X	X			
Sand equivalent (min.) [d]	CT 217	47	42	47	--
Asphalt binder content (%)	CT 379 or 382	JMF ± 0.45	JMF ± 0.45	JMF ± 0.50	JMF ± 0.50
HMA moisture content (%, max.)	CT 226 or CT 370	1.0	1.0	1.0	1.0
Field compaction (% max. theoretical density) [e,f]	CT 375	91 – 97	91 – 97	91 – 97	--
Stabilometer value (min.) [d,g]	CT 366				
No. 4 and 3/8" gradings		30	30	--	--
1/2" and 3/4" gradings		37	35	23	--
Air voids content (%) [d, h]	CT 367	4 ± 2	4 ± 2	Specification ± 2	--
Percent of crushed particles	CT 205				
Coarse aggregate (%, min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (%, min) (Passing No. 4 sieve and retained on No. 8 sieve.)					
One fractured face		70	20	70	90
Los Angeles Rattler (%, max.)	CT 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Fine aggregate angularity (%, min.) [i]	CT 234	45	45	45	--
Flat and elongated particles (%, max. by weight @ 5:1)	CT 235	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [j]	LP-3				
No. 4 grading		76.0 – 80.0	76.0 – 80.0	Report only	--
3/8" grading		73.0 – 76.0	73.0 – 76.0		
1/2" grading		65.0 – 75.0	65.0 – 75.0		
3/4" grading		65.0 – 75.0	65.0 – 75.0		
Voids in mineral aggregate (% min.) [j]	LP-2				
No. 4 grading		17.0	17.0	--	--
3/8" grading		15.0	15.0	--	
1/2" grading		14.0	14.0	18.0 – 23.0 [k]	
3/4" grading		13.0	13.0	18.0 – 23.0 [k]	
Dust proportion [j]	LP-4				
No. 4 and 3/8" gradings		0.9 – 2.0	0.9 – 2.0	Report only	--
1/2" and 3/4" gradings		0.6 – 1.3	0.6 – 1.3		
Smoothness	Section 39-1.12	12-foot straightedge, must-grind, and PI_0	12-foot straightedge, must-grind, and PI_0	12-foot straightedge, must-grind, and PI_0	12-foot straightedge and must-grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-	Section 92-

				1.02(C) and Section 39-1.02D	1.02(C) and Section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
Crumb rubber modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D

[a] The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.
[b] "X" denotes the sieves the Engineer considers for the specified aggregate gradation.
[c] The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."
[d] The Engineer reports the average of 3 tests from a single split sample.
[e] The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or No.4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[f] To determined field compaction, the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core.
2. California Test 309 to determine maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[g] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 140 °F ±5 °F by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 140 °F for a minimum of 2 hours and not more than 3 hours."
[h] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[i] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[j] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[k] Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 tons or 1 day's production.

For any single quality characteristic except smoothness, if 2 consecutive acceptance test results do not comply with the specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

The Engineer tests the density core you take from each 250 tons of HMA production. The Engineer determines the percent of maximum theoretical density for each density core by determining the density core's density and dividing by the maximum theoretical density.

The Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness if any of the following applies:

1. 1/2-inch, 3/8-inch, or No. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot and any layer is less than 0.20 foot.

For percent of maximum theoretical density, the Engineer determines a deduction for each test result outside the specifications in compliance with:

Reduced Payment Factors for Percent of Maximum Theoretical Density

HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density	Reduced Payment Factor	HMA Type A and B and RHMA-G Percent of Maximum Theoretical Density	Reduced Payment Factor
91.0	0.0000	97.0	0.0000
90.9	0.0125	97.1	0.0125
90.8	0.0250	97.2	0.0250
90.7	0.0375	97.3	0.0375
90.6	0.0500	97.4	0.0500
90.5	0.0625	97.5	0.0625
90.4	0.0750	97.6	0.0750
90.3	0.0875	97.7	0.0875
90.2	0.1000	97.8	0.1000
90.1	0.1125	97.9	0.1125
90.0	0.1250	98.0	0.1250
89.9	0.1375	98.1	0.1375
89.8	0.1500	98.2	0.1500
89.7	0.1625	98.3	0.1625
89.6	0.1750	98.4	0.1750
89.5	0.1875	98.5	0.1875
89.4	0.2000	98.6	0.2000
89.3	0.2125	98.7	0.2125
89.2	0.2250	98.8	0.2250
89.1	0.2375	98.9	0.2375
89.0	0.2500	99.0	0.2500
< 89.0	Remove and Replace	> 99.0	Remove and Replace

39-2.04 TRANSPORTING, SPREADING, AND COMPACTING

Determine the number of rollers needed to obtain the specified density and surface finish.

39-3 METHOD

39-3.01 DESCRIPTION

If HMA is specified as Method, construct it under Section 39-1, "General," this Section 39-3, "Method," and Section 39-5, "Measurement and Payment."

39-3.02 ENGINEER'S ACCEPTANCE

39-3.02A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance - Method

Quality Characteristic	Test Method	HMA Type			
		A	B	RHMA-G	OGFC
Aggregate gradation [a]	CT 202	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]
Sand equivalent (min.) [c]	CT 217	47	42	47	--
Asphalt binder content (%)	CT 379 or 382	JMF ± 0.45	JMF ± 0.45	JMF ± 0.50	JMF ± 0.50
HMA moisture content (%, max.)	CT 226 or CT 370	1.0	1.0	1.0	1.0
Stabilometer value (min.) [c,d]	CT 366				
No. 4 and 3/8" gradings		30	30	--	--
1/2" and 3/4" gradings		37	35	23	--
Percent of crushed particles	CT 205				
Coarse aggregate (% min.)					
One fractured face		90	25	--	90
Two fractured faces		75	--	90	75
Fine aggregate (% min) (Passing No. 4 sieve and retained on No. 8 sieve.)					
One fractured face		70	20	70	90
Los Angeles Rattler (% max.)	CT 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Air voids content (%) [c, e]	CT 367	4 ± 2	4 ± 2	Specification ± 2	--
Fine aggregate angularity (% min.)[f]	CT 234	45	45	45	--
Flat and elongated particles (% max. by weight @ 5:1)	CT 235	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [g]	LP-3			Report only	--
No. 4 grading		76.0 – 80.0	76.0 – 80.0		
3/8" grading		73.0 – 76.0	73.0 – 76.0		
1/2" grading		65.0 – 75.0	65.0 – 75.0		
3/4" grading		65.0 – 75.0	65.0 – 75.0		
Voids in mineral aggregate (% min.) [g]	LP-2				--
No. 4 grading		17.0	17.0	--	
3/8" grading		15.0	15.0	--	
1/2" grading		14.0	14.0	18.0 – 23.0 [h]	
3/4" grading		13.0	13.0	18.0 – 23.0 [h]	
Dust proportion [g]	LP-4			Report only	--
No. 4 and 3/8" gradings		0.9 – 2.0	0.9 – 2.0		
1/2" and 3/4" gradings		0.6 – 1.3	0.6 – 1.3		
Smoothness	Section 39-1.12	12-foot straightedge and must-grind	12-foot straightedge and must-grind	12-foot straightedge and must-grind	12-foot straightedge and must-grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-1.02(C) and Section 39-	Section 92-1.02(C) and Section 39-

				1.02D	1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
Crumb rubber modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D

[a] The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.
[b] The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."
[c] The Engineer reports the average of 3 tests from a single split sample.
[d] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 140 °F ±5 °F by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 140 °F for a minimum of 2 hours and not more than 3 hours."
[e] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[f] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[g] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[h] Voids in mineral aggregate for RHMA-G must be within this range.

No single test result may represent more than the smaller of 750 tons or 1 day's production.

For any single quality characteristic except smoothness, if 2 consecutive acceptance test results do not comply with the specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-3.03 SPREADING AND COMPACTING EQUIPMENT

Each paver spreading HMA Type A and Type B must be followed by 3 rollers:

1. One vibratory roller specifically designed to compact HMA. The roller must be capable of at least 2,500 vibrations per minute and must be equipped with amplitude and frequency controls. The roller's gross static weight must be at least 7.5 tons.
2. One oscillating type pneumatic-tired roller at least 4 feet wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 60 psi minimum and maintained so that the air pressure does not vary more than 5 psi.
3. One steel-tired, 2-axle tandem roller. The roller's gross static weight must be at least 7.5 tons.

Each roller must have a separate operator. Rollers must be self-propelled and reversible.

Compact RHMA-G under the specifications for compacting HMA Type A and Type B except do not use pneumatic-tired rollers.

Compact OGFC with steel-tired, 2-axle tandem rollers. If placing over 300 tons of OGFC per hour, use at least 3 rollers for each paver. If placing less than 300 tons of OGFC per hour, use at least 2 rollers for each paver. Each roller must weigh between 126 pounds to 172 pounds per linear inch of drum width. Turn the vibrator off.

39-3.04 TRANSPORTING, SPREADING, AND COMPACTING

Pave HMA in maximum 0.25-foot thick compacted layers.

If the surface to be paved is both in sunlight and shade, pavement surface temperatures are taken in the shade.

Spread HMA Type A and Type B only if atmospheric and surface temperatures are:

Minimum Atmospheric and Surface Temperatures

Compacted Layer Thickness, feet	Atmospheric,° F		Surface,° F	
	Unmodified Asphalt Binder	Modified Asphalt Binder[a]	Unmodified Asphalt Binder	Modified Asphalt Binder [a]
< 0.15	55	50	60	55
0.15 – 0.25	45	45	50	50

Note:
[a] Except asphalt rubber binder.

If the asphalt binder for HMA Type A and Type B is:

1. Unmodified asphalt binder, complete:

   1.1. First coverage of breakdown compaction before the surface temperature drops below 250 °F
   1.2. Breakdown and intermediate compaction before the surface temperature drops below 200 °F
   1.3. Finish compaction before the surface temperature drops below 150 °F

2. Modified asphalt binder, complete:

   2.1. First coverage of breakdown compaction before the surface temperature drops below 240 °F
   2.2. Breakdown and intermediate compaction before the surface temperature drops below 180 °F
   2.3. Finish compaction before the surface temperature drops below 140 °F

For RHMA-G:

1. Only spread and compact if the atmospheric temperature is at least 55 °F and the surface temperature is at least 60 °F.
2. Complete the first coverage of breakdown compaction before the surface temperature drops below 285 °F.
3. Complete breakdown and intermediate compaction before the surface temperature drops below 250 °F.
4. Complete finish compaction before the surface temperature drops below 200 °F.
5. If the atmospheric temperature is below 70 °F, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For OGFC with unmodified asphalt binder:

1. Only spread and compact if the atmospheric temperature is at least 55 °F and the surface temperature is at least 60 °F.
2. Complete first coverage using 2 rollers before the surface temperature drops below 240 °F.
3. Complete all compaction before the surface temperature drops below 200 °F.
4. If the atmospheric temperature is below 70 °F, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For OGFC with modified asphalt binder except asphalt rubber binder:

1. Only spread and compact if the atmospheric temperature is at least 50 °F and the surface temperature is at least 50 °F.
2. Complete first coverage using 2 rollers before the surface temperature drops below 240 °F.
3. Complete all compaction before the surface temperature drops below 180 °F.
4. If the atmospheric temperature is below 70 °F, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or to the pavement surface.

For RHMA-O and RHMA-O-HB:

1. Only spread and compact if the atmospheric temperature is at least 55 °F and surface temperature is at least 60 °F.

2 Complete the 1st coverage using 2 rollers before the surface temperature drops below 280 °F.
3. Complete compaction before the surface temperature drops below 250 °F.
4. If the atmospheric temperature is below 70 °F, cover loads in trucks with tarpaulins. The tarpaulins must completely cover the exposed load until the mixture is transferred to the paver's hopper or to the pavement surface.

For RHMA-G and OGFC, tarpaulins are not required if the time from discharge to truck until transfer to the paver's hopper or the pavement surface is less than 30 minutes.

HMA compaction coverage is the number of passes needed to cover the paving width. A pass is 1 roller's movement parallel to the paving in either direction. Overlapping passes are part of the coverage being made and are not a subsequent coverage. Do not start a coverage until completing the prior coverage.

Start rolling at the lower edge and progress toward the highest part.

Perform breakdown compaction of each layer of HMA Type A, Type B, and RHMA-G with 3 coverages using a vibratory roller. The speed of the vibratory roller in miles per hour must not exceed the vibrations per minute divided by 1,000. If the HMA layer thickness is less than 0.08 foot, turn the vibrator off. The Engineer may order fewer coverages if the HMA layer thickness is less than 0.15 foot.

Perform intermediate compaction of each layer of HMA Type A and Type B with 3 coverages using a pneumatic-tired roller at a speed not to exceed 5 mph.

Perform finish compaction of HMA Type A, Type B, and RHMA-G with 1 coverage using a steel-tired roller.

Compact OGFC with 2 coverages using steel-tired rollers.

39-4 QUALITY CONTROL / QUALITY ASSURANCE

39-4.01 DESCRIPTION

If HMA is specified as Quality Control / Quality Assurance, construct it under Section 39-1, "General," this Section 39-4, "Quality Control / Quality Assurance," and Section 39-5, "Measurement and Payment."

39-4.02 GENERAL

The QC / QA construction process consists of:

1. Establishing, maintaining, and changing if needed a quality control system providing assurance the HMA complies with the specifications
2. Sampling and testing at specified intervals, or sublots, to demonstrate compliance and to control process
3. The Engineer sampling and testing at specified intervals to verify testing process and HMA quality
4. The Engineer using test results, statistical evaluation of verified quality control tests, and inspection to accept HMA for payment

A lot is a quantity of HMA. The Engineer designates a new lot when:

1. 20 sublots are complete
2. The JMF changes
3. Production stops for more than 30 days

Each lot consists of no more than 20 sublots. A sublot is 750 tons except HMA paved at day's end greater than 250 tons is a sublot. If HMA paved at day's end is less than 250 tons, you may either make this quantity a sublot or include it in the previous sublot's test results for statistical evaluation.

39-4.03 CONTRACTOR QUALITY CONTROL

39-4.03A General

Use a composite quality factor, QF_C, and individual quality factors, QF_{QCi}, to control your process and evaluate your quality control program. For quality characteristics without quality factors, use your quality control plan's action limits to control process.

Control HMA quality including:

1. Materials
2. Proportioning
3. Spreading and compacting
4. Finished roadway surface

Develop, implement, and maintain a quality control program that includes:

1. Inspection
2. Sampling
3. Testing

39-4.03B Quality Control Plan

With the JMF submittal, submit a written Quality Control Plan (QCP). The QCP must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement. Discuss the QCP with the Engineer during the prepaving conference.

The Engineer reviews each QCP within 5 business days from the submittal. Hold HMA production until the Engineer accepts the QCP in writing. The Engineer's QCP acceptance does not mean your compliance with the QCP will result in acceptable HMA. Section 39-1.05, "Engineer's Acceptance," specifies HMA acceptance.

The QCP must include the name and qualifications of a Quality Control Manager. The Quality Control Manager administers the QCP and during paving must be at the job site within 3 hours of receiving notice. The Quality Control Manager must not be any of the following on the project:

1. Foreman
2. Production or paving crewmember
3. Inspector
4. Tester

The QCP must include action limits and details of corrective action you will take if a test result for any quality characteristic falls outside an action limit.

As work progresses, you must submit a written QCP supplement to change quality control procedures, personnel, tester qualification status, or laboratory accreditation status.

39-4.03C Quality Control Inspection, Sampling, And Testing

Sample, test, inspect, and manage HMA quality control.

Provide a roadway inspector while HMA paving activities are in progress. Provide a plant inspector during HMA production.

Inspectors must comply with the Department's Quality Control Manual for Hot Mix Asphalt Production and Placement.

Provide a testing laboratory and personnel for quality control testing. Provide the Engineer unrestricted access to the quality control activities. Before providing services for the project, the Engineer reviews, accredits, and qualifies the testing laboratory and personnel under the Department's Independent Assurance Program.

The minimum random sampling and testing for quality control is:

Minimum Quality Control – QC / QA

Quality Characteristic	Test Method	Min-imum Sampl-ing and Testing Frequen-cy	HMA Type			Location of Sampling	Max. Report-ing Time Allow-ance
			A	B	RHMA-G		
Aggregate gradation [a]	CT 202	1 per 750 tons	JMF ± Tolerance [b]	JMF ± Tolerance [b]	JMF ± Tolerance [b]	CT 125	24 hours
Asphalt binder content (%)	CT 379 or 382		JMF ±0.45	JMF ±0.45	JMF ±0.5	Loose Mix Behind Paver See CT 125	
Field compaction (% max. theoretical density) [c,d]	QC Plan		92 - 96	92 - 96	91 - 96	QC Plan	
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants [e]	CT 226 or CT 370	2 per day during produc-tion	--	--	--	Stock-piles or cold feed belts	--
Sand equivalent (min.) [f]	CT 217	1 per 750 tons	47	42	47	CT 125	24 hours
HMA moisture content (%,max.)	CT 226 or CT 370	1 per 2,500 tons but not less than 1 per paving day	1.0	1.0	1.0	Loose Mix Behind Paver See CT 125	24 hours
Stabilometer Value (min.) [f, g] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	CT 366	1 per 4,000 tons or 2 per 5 bus-iness days, which-ever is more	30 37	30 35	-- 23		48 hours
Air voids content (%)[f, h]	CT 367		4 ± 2	4 ± 2	Specifica-tion ± 2		

Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min) (Passing No. 4 sieve and retained on No. 8 sieve.) One fractured face	CT 205	As neces-sary and designat-ed in QCP. At least once per project.	90 75 70	25 -- 20	-- 90 70	CT 125	48 hours
Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.	CT 211		12 45	-- 50	12 40	CT 125	
Fine aggregate angularity (% min.) [i]	CT 234		45	45	45	CT 125	
Flat and elongated particle (% max. by weight @ 5:1)	CT 235		Report only	Report only	Report only	CT 125	
Voids filled with asphalt (%) [j] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	LP-3		76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	76.0 – 80.0 73.0 – 76.0 65.0 – 75.0 65.0 – 75.0	Report only	LP-3	
Voids in mineral aggregate (% min.) [j] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	LP-2		17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0 – 23.0 [k] 18.0 – 23.0 [k]	LP-2	
Dust proportion [j] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	LP-4		0.9 – 2.0 0.6 – 1.3	0.9 – 2.0 0.6 – 1.3	Report only	LP-4	
Smoothness	Section 39-1.12	--	12-foot straight-edge, must-grind, and PI_0	12-foot straight-edge, must-grind, and PI_0	12-foot straight-edge, must-grind, and PI_0	--	
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D	--	--	--	1,500 – 4,000	Section 39-1.02D	24 hours
Crumb rubber modifier	Section 39-1.02D	--	--	--	Section 39-1.02D	Section 39-1.02D	48 hours

Notes:

[a] Determine combined aggregate gradation containing RAP under Laboratory Procedure LP-9.

[b] The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."

[c] Determine field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, No. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[d] To determine field compaction use:

1. In-place density measurements using the method specified in your QC.
2. California Test 309 to determine maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[e] For adjusting the plant controller at the HMA plant.
[f] Report the average of 3 tests from a single split sample.
[g] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 140 °F ± 5 °F by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 140 °F for a minimum of 2 hours and not more than 3 hours."
[h] Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[i] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[j] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[k] Voids in mineral aggregate for RHMA-G must be within this range.

Within the specified reporting time, submit written test results including:

1. Sampling location, quantity, and time
2. Testing results
3. Supporting data and calculations

If test results for any quality characteristic are beyond the action limits in the QCP, take corrective actions. Document the corrective actions taken in the inspection records under Section 39-4.03E, "Records of Inspection and Testing."

Stop production, notify the Engineer in writing, take corrective action, and demonstrate compliance with the specifications before resuming production and placement on the State highway if:

1. A lot's composite quality factor, QF_C, or an individual quality factor, QF_{QCi} for i = 3, 4, or 5, is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation," using quality control data
2. An individual quality factor, QF_{QCi} for i = 1 or 2, is below 0.75 using quality control data
3. Quality characteristics for which a quality factor, QF_{QCi}, is not determined has 2 consecutive quality control tests not in compliance with the specifications

39-4.03D Charts And Records

Record sampling and testing results for quality control on forms provided in the "Quality Control Manual for Hot Mix Asphalt," or on forms you submit with the QCP. The QCP must also include form posting locations and submittal times.

Submit quality control test results using the Department's statistical evaluation program, HMAPay, available at

www.dot.ca.gov/hq/construc/hma/index.htm

39-4.03E Records Of Inspection And Testing

During HMA production, submit in writing a daily:

1. HMA Construction Daily Record of Inspection. Also make this record available at the HMA plant and job site each day.
2. HMA Inspection and Testing Summary. Include in the summary:

    2.1. QC worksheet with updated test results from the HMAPay program
    2.2. Test forms with the testers' signatures and Quality Control Manager's initials.
    2.3. Inspection forms with the inspectors' signatures and Quality Control Manager's initials.
    2.4. A list and explanation of deviations from the specifications or regular practices.
    2.5. A signed statement by the Quality Control Manager that says:

    "It is hereby certified that the information contained in this record is accurate, and that information, tests, or calculations documented herein comply with the specifications of the contract and the

standards set forth in the testing procedures. Exceptions to this certification are documented as part of this record."

Retain for inspection the records generated as part of quality control including inspection, sampling, and testing for at least 3 years after final acceptance.

39-4.03F Statistical Evaluation

General

Determine a lot's composite quality factor, QF_C, and the individual quality factors, QF_{QCi}. Perform statistical evaluation calculations to determine these quality factors based on quality control test results for:

1. Aggregate gradation
2. Asphalt binder content
3. Percent of maximum theoretical density

The Engineer grants a waiver and you must use 1.0 as the individual quality factor for percent of maximum theoretical density, QF_{QC5}, for HMA paved in:

1. Areas where the total paved thickness is less than 0.15 foot
2. Areas where the total paved thickness is less than 0.20 foot and a 3/4-inch grading is specified and used
3. Dig outs
4. Leveling courses
5. Areas where, in the opinion of the Engineer, compaction or compaction measurement by conventional methods is impeded

Statistical Evaluation Calculations

Use the Variability-Unknown / Standard Deviation Method to determine the percentage of a lot not in compliance with the specifications.

Determine the percentage of work not in compliance with the specification limits for each quality characteristic as follows:

1. Calculate the arithmetic mean ($\overline{X}$) of the test values

$$\overline{X} = \frac{\Sigma x}{n}$$

where:

x = individual test values
n = number of test values

2. Calculate the standard deviation

$$s = \sqrt{\frac{n\,(\Sigma x^2)-(\Sigma x)^2}{n(n-1)}}$$

where:

$\sum(x^2)$ = sum of the squares of individual test values
$(\sum x)^2$ = sum of the individual test values squared
n = number of test values

3. Calculate the upper quality index (Qu)

$$Q_u = \frac{USL - \overline{X}}{s}$$

where:

USL = target value plus the production tolerance or upper specification limit

$s =$ standard deviation
$\bar{X} =$ arithmetic mean

4. Calculate the lower quality index (QL);

$$Q_L = \frac{\bar{X} - LSL}{s}$$

where:

$LSL =$ target value minus production tolerance or lower specification limit
$s =$ standard deviation
$\bar{X} =$ arithmetic mean

5. From the table, Upper Quality Index Q_U or Lower Quality Index Q_L, of this Section 39-4.03F, "Statistical Evaluation", determine P_U ;

where:

$P_U =$ the estimated percentage of work outside the USL.
$P_U = 0$, when USL is not specified.

6. From the table, Upper Quality Index Q_U or Lower Quality Index Q_L, of this Section 39-4.03F, "Statistical Evaluation," determine P_L;

where:

$P_L =$ the estimated percentage of work outside the LSL.
$P_L = 0$, when LSL is not specified.

7. Calculate the total estimated percentage of work outside the USL and LSL, percent defective

Percent defective $= P_U + P_L$

P_U and P_L are determined from:

P_U or P_L	**Upper Quality Index Q_U or Lower Quality Index Q_L**												
	Sample Size (n)												
	5	6	7	8	9	10-11	12-14	15-17	18-22	23-29	30-42	43-66	>66
0	1.72	1.88	1.99	2.07	2.13	2.20	2.28	2.34	2.39	2.44	2.48	2.51	2.56
1	1.64	1.75	1.82	1.88	1.91	1.96	2.01	2.04	2.07	2.09	2.12	2.14	2.16
2	1.58	1.66	1.72	1.75	1.78	1.81	1.84	1.87	1.89	1.91	1.93	1.94	1.95
3	1.52	1.59	1.63	1.66	1.68	1.71	1.73	1.75	1.76	1.78	1.79	1.80	1.81
4	1.47	1.52	1.56	1.58	1.60	1.62	1.64	1.65	1.66	1.67	1.68	1.69	1.70
5	1.42	1.47	1.49	1.51	1.52	1.54	1.55	1.56	1.57	1.58	1.59	1.59	1.60
6	1.38	1.41	1.43	1.45	1.46	1.47	1.48	1.49	1.50	1.50	1.51	1.51	1.52
7	1.33	1.36	1.38	1.39	1.40	1.41	1.41	1.42	1.43	1.43	1.44	1.44	1.44
8	1.29	1.31	1.33	1.33	1.34	1.35	1.35	1.36	1.36	1.37	1.37	1.37	1.38
9	1.25	1.27	1.28	1.28	1.29	1.29	1.30	1.30	1.30	1.31	1.31	1.31	1.31
10	1.21	1.23	1.23	1.24	1.24	1.24	1.25	1.25	1.25	1.25	1.25	1.26	1.26
11	1.18	1.18	1.19	1.19	1.19	1.19	1.20	1.20	1.20	1.20	1.20	1.20	1.20
12	1.14	1.14	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
13	1.10	1.10	1.10	1.10	1.10	1.10	1.11	1.11	1.11	1.11	1.11	1.11	1.11
14	1.07	1.07	1.07	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
15	1.03	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
16	1.00	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
17	0.97	0.96	0.95	0.95	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.94
18	0.93	0.92	0.92	0.92	0.91	0.91	0.91	0.91	0.90	0.90	0.90	0.90	0.90
19	0.90	0.89	0.88	0.88	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
20	0.87	0.86	0.85	0.85	0.84	0.84	0.84	0.83	0.83	0.83	0.83	0.83	0.83
21	0.84	0.82	0.82	0.81	0.81	0.81	0.80	0.80	0.80	0.80	0.80	0.80	0.79
22	0.81	0.79	0.79	0.78	0.78	0.77	0.77	0.77	0.76	0.76	0.76	0.76	0.76
23	0.77	0.76	0.75	0.75	0.74	0.74	0.74	0.73	0.73	0.73	0.73	0.73	0.73
24	0.74	0.73	0.72	0.72	0.71	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70
25	0.71	0.70	0.69	0.69	0.68	0.68	0.67	0.67	0.67	0.67	0.67	0.67	0.66
26	0.68	0.67	0.67	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.63
27	0.65	0.64	0.63	0.62	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.60
28	0.62	0.61	0.60	0.59	0.59	0.59	0.58	0.58	0.58	0.58	0.58	0.58	0.57
29	0.59	0.58	0.57	0.57	0.56	0.56	0.55	0.55	0.55	0.55	0.55	0.55	0.54
30	0.56	0.55	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52
31	0.53	0.52	0.51	0.51	0.50	0.50	0.50	0.49	0.49	0.49	0.49	0.49	0.49
32	0.50	0.49	0.48	0.48	0.48	0.47	0.47	0.47	0.46	0.46	0.46	0.46	0.46
33	0.47	0.48	0.45	0.45	0.45	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.43
34	0.45	0.43	0.43	0.42	0.42	0.42	0.41	0.41	0.41	0.41	0.41	0.41	0.40
35	0.42	0.40	0.40	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.38
36	0.39	0.38	0.37	0.37	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
37	0.36	0.35	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.32
38	0.33	0.32	0.32	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.30	0.30	0.30
39	0.30	0.30	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
40	0.28	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
41	0.25	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
42	0.23	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
43	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
44	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
45	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
46	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
47	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
48	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
49	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1. If the value of Q_U or Q_L does not correspond to a value in the table, use the next lower value.
2. If Q_U or Q_L are negative values, P_U or P_L is equal to 100 minus the table value for P_U or P_L.

Quality Factor Determination

Determine individual quality factors, QF_{QCi}, using percent defective = $P_U + P_L$ and:

Quality Factors

Quality Factor	Maximum Allowable Percent Defective ($P_U + P_L$)												
	Sample Size (n)												
	5	6	7	8	9	10-11	12-14	15-17	18-22	23-29	30-42	43-66	>66
1.05				0	0	0	0	0	0	0	0	0	0
1.04			0	1	3	5	4	4	4	3	3	3	3
1.03		0	2	4	6	8	7	7	6	5	5	4	4
1.02		1	3	6	9	11	10	9	8	7	7	6	6
1.01	0	2	5	8	11	13	12	11	10	9	8	8	7
1.00	22	20	18	17	16	15	14	13	12	11	10	9	8
0.99	24	22	20	19	18	17	16	15	14	13	11	10	9
0.98	26	24	22	21	20	19	18	16	15	14	13	12	10
0.97	28	26	24	23	22	21	19	18	17	16	14	13	12
0.96	30	28	26	25	24	22	21	19	18	17	16	14	13
0.95	32	29	28	26	25	24	22	21	20	18	17	16	14
0.94	33	31	29	28	27	25	24	22	21	20	18	17	15
0.93	35	33	31	29	28	27	25	24	22	21	20	18	16
0.92	37	34	32	31	30	28	27	25	24	22	21	19	18
0.91	38	36	34	32	31	30	28	26	25	24	22	21	19
0.90	39	37	35	34	33	31	29	28	26	25	23	22	20
0.89	41	38	37	35	34	32	31	29	28	26	25	23	21
0.88	42	40	38	36	35	34	32	30	29	27	26	24	22
0.87	43	41	39	38	37	35	33	32	30	29	27	25	23
0.86	45	42	41	39	38	36	34	33	31	30	28	26	24
0.85	46	44	42	40	39	38	36	34	33	31	29	28	25
0.84	47	45	43	42	40	39	37	35	34	32	30	29	27
0.83	49	46	44	43	42	40	38	36	35	33	31	30	28
0.82	50	47	46	44	43	41	39	38	36	34	33	31	29
0.81	51	49	47	45	44	42	41	39	37	36	34	32	30
0.80	52	50	48	46	45	44	42	40	38	37	35	33	31
0.79	54	51	49	48	46	45	43	41	39	38	36	34	32
0.78	55	52	50	49	48	46	44	42	41	39	37	35	33
0.77	56	54	52	50	49	47	45	43	42	40	38	36	34
0.76	57	55	53	51	50	48	46	44	43	41	39	37	35
0.75	58	56	54	52	51	49	47	46	44	42	40	38	36
	60	57	55	53	52	51	48	47	45	43	41	40	37
	61	58	56	55	53	52	50	48	46	44	43	41	38
Reject	62	59	57	56	54	53	51	49	47	45	44	42	39
	63	61	58	57	55	54	52	50	48	47	45	43	40
	64	62	60	58	57	55	53	51	49	48	46	44	41
Reject Values Greater Than Those Shown Above													

Notes:

1. To obtain a quality factor when the estimated percent outside specification limits from table, "Upper Quality Index Q_U or Lower Quality Index Q_L," does not correspond to a value in the table, use the next larger value.

Compute the composite of single quality factors, QF_C, for a lot using:

$$QF_C = \sum_{i=1}^{5} w_i \, QF_{QC_i}$$

where:

QF_C = the composite quality factor for the lot rounded to 2 decimal places.
QF_{QCi} = the quality factor for the individual quality characteristic.
w = the weighting factor listed in the table HMA Acceptance – QC / QA.

i = the quality characteristic index number in the table HMA Acceptance – QC / QA.

39-4.04 ENGINEER'S QUALITY ASSURANCE

39-4.04A General

The Engineer assures quality by:

1. Reviewing mix designs and proposed JMF
2. Inspecting procedures
3. Conducting oversight of quality control inspection and records
4. Verification sampling and testing during production and paving

39-4.04B Verification Sampling And Testing

General

The Engineer samples:

1. Aggregate to verify gradation
2. HMA to verify asphalt binder content

Verification

For aggregate gradation and asphalt binder content, the minimum ratio of verification testing frequency to quality control testing frequency is 1:5. The Engineer performs at least 3 verification tests per lot.

Using the t-test, the Engineer compares quality control tests results for aggregate gradation and asphalt binder content with corresponding verification test results. The Engineer uses the average and standard deviation of up to 20 sequential sublots for the comparison. The Engineer uses production start-up evaluation tests to represent the first sublot. When there are less than 20 sequential sublots, the Engineer uses the maximum number of sequential sublots available. The 21st sublot becomes the 1st sublot (n = 1) in the next lot.

The t-value for a group of test data is computed as follows:

$$t = \frac{\left|\overline{X}_c - \overline{X}_v\right|}{S_p\sqrt{\frac{1}{n_c} + \frac{1}{n_v}}} \qquad \text{and} \qquad S_p^2 = \frac{S_c^2(n_c - 1) + S_v^2(n_v - 1)}{n_c + n_v - 2}$$

where:

n_c = Number of quality control tests (2 minimum, 20 maximum).
n_v = Number of verification tests (minimum of 1 required).
$\overline{X}_c$ = Mean of quality control tests.
$\overline{X}_v$ = Mean of verification tests.
S_p = Pooled standard deviation (When $n_v = 1$, $S_p = S_c$).
S_c = Standard deviation of quality control tests.
S_v = Standard deviation of verification tests (when $n_v > 1$).

The comparison of quality control test results and the verification test results is at a level of significance of $\alpha = 0.025$. The Engineer computes t and compares it to the critical t-value, t_{crit}, from:

Critical T-Value

Degrees of freedom (n_c+n_v-2)	t_{crit} (for α = 0.025)	Degrees of freedom (n_c+n_v-2)	t_{crit} (for α = 0.025)
1	24.452	18	2.445
2	6.205	19	2.433
3	4.177	20	2.423
4	3.495	21	2.414
5	3.163	22	2.405
6	2.969	23	2.398
7	2.841	24	2.391
8	2.752	25	2.385
9	2.685	26	2.379
10	2.634	27	2.373
11	2.593	28	2.368
12	2.560	29	2.364
13	2.533	30	2.360
14	2.510	40	2.329
15	2.490	60	2.299
16	2.473	120	2.270
17	2.458	∞	2.241

If the t-value computed is less than or equal to t_{crit}, quality control test results are verified.

If the t-value computed is greater than t_{crit} and both $\overline{X}_v$ and $\overline{X}_c$ comply with acceptance specifications, the quality control tests are verified. You may continue to produce and place HMA with the following allowable differences:

1. $\left|\overline{X}_v - \overline{X}_c\right| \leq 1.0$ percent for any grading
2. $\left|\overline{X}_v - \overline{X}_c\right| \leq 0.1$ percent for asphalt binder content

If the t-value computed is greater than t_{crit} and the $\left|\overline{X}_v - \overline{X}_c\right|$ for grading or asphalt binder content are greater than the allowable differences, quality control test results are not verified and:

1. The Engineer notifies you in writing.
2. You and the Engineer must investigate why the difference exist.
3. If the reason for the difference cannot be found and corrected, the Engineer's test results are used for acceptance and pay.

39-4.05 ENGINEER'S ACCEPTANCE

39-4.05A Testing

The Engineer samples for acceptance testing and tests for:

HMA Acceptance – QC / QA

Index (i)	Quality Characteristic				Weight-ing Factor (w)	Test Method	HMA Type		
							A	B	RHMA-G
		Aggregate gradation [a]							
	Sieve	3/4"	1/2"	3/8"					
1	1/2"	X [b]	--	--	0.05	CT 202	JMF ± Tolerance [c]		
1	3/8"	--	X	--	0.05				
1	No. 4	--	--	X	0.05				
2	No. 8	X	X	X	0.10				
3	No. 200	X	X	X	0.15				
4	Asphalt binder content (%)				0.30	CT 379 or 382	JMF ± 0.45	JMF ± 0.45	JMF ± 0.5
5	Field compaction (% max. theoretical density) [d,e]				0.40	CT 375	92 – 96	92 – 96	91 – 96
	Sand equivalent (min.) [f]					CT 217	47	42	47
	Stabilometer value (min.) [f,, g] No. 4 and 3/8" gradings 1/2" and 3/4" gradings					CT 366	 30 37	 30 35	 -- 23
	Air voids content (%)[f, h]					CT 367	4 ± 2	4 ± 2	Specifica-tion ± 2
	Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min) (Passing No. 4 sieve and retained on No. 8 sieve.) One fractured face					CT 205	 90 75 70	 25 -- 20	 -- 90 70
	HMA moisture content (%, max.)					CT 226 or CT 370	1.0	1.0	1.0
	Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.					CT 211	 12 45	 -- 50	 12 40
	Fine aggregate angularity (% min.) [i]					CT 234	45	45	45
	Flat and elongated particle (% max. by weight @ 5:1)					CT 235	Report only	Report only	Report only
	Voids in mineral aggregate (% min.)[j] No. 4 grading 3/8" grading 1/2" grading 3/4" grading					LP-2	 17.0 15.0 14.0 13.0	 17.0 15.0 14.0 13.0	(Note k) -- -- 18.0 - 23.0 18.0 - 23.0
	Voids filled with asphalt (%) [j] No. 4 grading 3/8" grading 1/2" grading 3/4" grading					LP-3	 76.0 - 80.0 73.0 - 76.0 65.0 - 75.0 65.0 - 75.0	 76.0 - 80.0 73.0 - 76.0 65.0 - 75.0 65.0 - 75.0	Report only
	Dust proportion [j] No. 4 and 3/8" gradings 1/2" and 3/4" gradings					LP-4	 0.9 - 2.0 0.6 - 1.3	 0.9 – 2.0 0.6 – 1.3	Report only

	Smoothness		Section 39-1.12	12-foot straight-edge, must-grind, and PI_0	12-foot straight-edge, must-grind, and PI_0	12-foot straight-edge, must-grind, and PI_0
	Asphalt binder		Various	Section 92	Section 92	Section 92
	Asphalt rubber binder		Various	--	--	Section 92-1.02(C) and Section 39-1.02D
	Asphalt modifier		Various	--	--	Section 39-1.02D
	Crumb rubber modifier		Various	--	--	Section 39-1.02D

Notes:
[a] The Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.
[b] "X" denotes the sieves the Engineer considers for the specified aggregate gradation.
[c] The tolerances must comply with the allowable tolerances in Section 39-1.02E, "Aggregate."
[d] The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or No.4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

[e] To determined field compaction, the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core.
2. California Test 309 to determine maximum theoretical density at the frequency specified in California Test 375, Part 5C.

[f] The Engineer reports the average of 3 tests from a single split sample.
[g] Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 140 °F ± 5 °F by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 140 °F for a minimum of 2 hours and not more than 3 hours."
[h] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
[i] The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[j] Report only if the adjustment for asphalt binder content target value is less than or equal to ± 0.3 percent from OBC.
[k] Voids in mineral aggregate for RHMA-G must be within this range.

The Engineer determines the percent of maximum theoretical density from the average density of 3 density cores you take from every 750 tons of production or part thereof divided by the maximum theoretical density.

The Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness if any of the following applies:

1. If 1/2-inch, 3/8-inch, or No. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15 foot.
2. If 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot and any layer is less than 0.20 foot.

The Engineer calculates QF_{QCi} for i = 1, 2, 3, and 4 using quality control data and QF_{QCi} for i = 5 using quality assurance data.

The Engineer stops production and terminates a lot if:

1. The lot's composite quality factor, QF_C, or an individual quality factor, QF_{QCi} for i = 3, 4, or 5, is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation"
2. An individual quality factor, QF_{QCi} for i = 1 or 2, is below 0.75

3. Quality characteristics for which a quality factor, QF_{QCi}, is not determined has 2 consecutive acceptance or quality control tests not in compliance with the specifications

For any single quality characteristic for which a quality factor, QF_{QCi}, is not determined, except smoothness, if 2 consecutive acceptance test results do not comply with specifications:

1. Stop production.
2. Take corrective action.
3. In the Engineer's presence, take samples and split each sample into 4 parts. Test 1 part for compliance with the specifications and submit 3 parts to the Engineer. The Engineer tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-4.05B Statistical Evaluation, Determination Of Quality Factors And Acceptance

Statistical Evaluation and Determination of Quality Factors

To determine the individual quality factor, $QF_{QCi,}$ for any quality factor i = 1 through 5 or a lot's composite quality factor, QF_C, for acceptance and payment adjustment, the Engineer uses the evaluation specifications under Section 39-4.03F, "Statistical Evaluation," and:

1. Verified quality control test results for aggregate gradation
2. Verified quality control test results for asphalt binder content
3. The Engineer's test results for percent of maximum theoretical density

Lot Acceptance Based on Quality Factors

The Engineer accepts a lot based on the quality factors determined for aggregate gradation and asphalt binder content, QF_{QCi} for i = 1 through 4, using the total number of verified quality control test result values and the total percent defective ($P_U + P_L$).

The Engineer accepts a lot based on the quality factor determined for maximum theoretical density, QF_{QC5}, using the total number of test result values from density cores and the total percent defective ($P_U + P_L$).

The Engineer calculates the quality factor for the lot, QF_C, which is a composite of weighted individual quality factors, QF_{QCi}, determined for each quality characteristic in the HMA Acceptance – QC / QA table in Section 39-4.05A, "Testing."

The Engineer accepts a lot based on quality factors if:

1. The current composite quality factor, QF_C, is 0.90 or greater
2. Each individual quality factor, QF_{QCi} for i = 3, 4, and 5, is 0.90 or greater
3. Each individual quality factor, QF_{QCi} for i = 1 and 2, is 0.75 or greater

No single quality characteristic test may represent more than the smaller of 750 tons or 1 day's production.

Payment Adjustment

If a lot is accepted, the Engineer adjusts payment with the following formula:

$$PA = \sum_{i=1}^{n} HMACP * wi * \left[QFQCi * (HMATT - WHMATTi) + WHMATTi\right] - (HMACP * HMATT)$$

where:

PA =	Payment adjustment rounded to 2 decimal places.
HMACP =	HMA contract price.
HMATT =	HMA total tons represented in the lot.
$WHMATT_i$ =	Total tons of waived quality characteristic HMA.
QF_{QCi} =	Running quality factor for the individual quality characteristic. QF_{QCi} for i = 1 through 4 must be from verified Contractor's QC results. QF_{QC5} must be determined from the Engineer's results on density cores taken for percent of maximum theoretical density determination.
w =	Weighting factor listed in the HMA acceptance table.

i = Quality characteristic index number in the HMA acceptance table.

If the payment adjustment is a negative value, the Engineer deducts this amount from payment. If the payment adjustment is a positive value, the Engineer adds this amount to payment.

The 21st sublot becomes the 1st sublot (n = 1) in the next lot. When the 21st sequential sublot becomes the 1st sublot, the previous 20 sequential sublots become a lot for which the Engineer determines a quality factor. The Engineer uses this quality factor to pay for the HMA in the lot. If the next lot consists of less than 8 sublots, these sublots must be added to the previous lot for quality factor determination using 21 to 27 sublots.

39-4.05C Dispute Resolution

For a lot, if you or the Engineer dispute any quality factor, QF_{QCi}, or verification test result, every sublot in that lot must be retested.

Referee tests must be performed under the specifications for acceptance testing.

Any quality factor, QF_{QCi}, must be determined using the referee tests.

For any quality factor, QF_{QCi}, for i = 1 through 5, dispute resolution:

1. If the difference between the quality factors for QF_{QCi} using the referee test result and the disputed test result is less than or equal to 0.01, the original test result is correct.
2. If the difference between the quality factor for QF_{QCi} using the referee test result and the disputed test result is more than 0.01, the quality factor determined from the referee tests supersedes the previously determined quality factor.

39-5 MEASUREMENT AND PAYMENT

39-5.01 MEASUREMENT

The contract item for HMA is measured by weight. The weight of each HMA mixture designated in the Engineer's Estimate must be the combined mixture weight.

If tack coat, asphalt binder, and asphaltic emulsion are paid with separate contract items, their contract items are measured under Section 92, "Asphalts," or Section 94, "Asphaltic Emulsions," as the case may be.

If recorded batch weights are printed automatically, the contract item for HMA is measured by using the printed batch weights, provided:

1. Total aggregate and supplemental fine aggregate weight per batch is printed. If supplemental fine aggregate is weighed cumulatively with the aggregate, the total aggregate batch weight must include the supplemental fine aggregate weight.
2. Total asphalt binder weight per batch is printed.
3. Each truckload's zero tolerance weight is printed before weighing the first batch and after weighing the last batch.
4. Time, date, mix number, load number and truck identification is correlated with a load slip.
5. A copy of the recorded batch weights is certified by a licensed weighmaster and submitted to the Engineer.

The contract item for placing HMA dike is measured by the linear foot along the completed length. The contract item for placing HMA in miscellaneous areas is measured as the in-place compacted area in square yards. In addition to the quantities measured on a linear foot or square yard basis, the HMA for dike and miscellaneous areas are measured by weight.

The contract item for geosynthetic pavement interlayer is measured by the square yard for the actual pavement area covered.

39-5.02 PAYMENT

The contract prices paid per ton for hot mix asphalt as designated in the Engineer's Estimate include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in constructing hot mix asphalt, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

If HMA is specified to comply with Section 39-4, "Quality Control / Quality Assurance," the Engineer adjusts payment under that section.

Full compensation for the Quality Control Plan and prepaving conference is included in the contract prices paid per ton for hot mix asphalt as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for performing and submitting mix designs and for Contractor sampling, testing, inspection, testing facilities, and preparation and submittal of results is included in the contract prices paid per ton for HMA as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

Full compensation for reclaimed asphalt pavement is included in the contract prices paid per ton for HMA as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

The contract price paid per ton for hot mix asphalt (leveling) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in hot mix asphalt (leveling), complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The State pays for HMA dike at the contract price per linear foot for place HMA dike and by the ton for HMA. The contract prices paid per linear foot for place hot mix asphalt dike as designated in the Engineer's Estimate include full compensation for furnishing all labor, tools, equipment, and incidentals, and for doing all the work involved in placing HMA dike, complete in place, including excavation, backfill, and preparation of the area to receive the dike, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The State pays for HMA specified to be a miscellaneous area at the contract price per square yard for place hot mix asphalt (miscellaneous area) and per ton for hot mix asphalt. The contract price paid per square yard for place hot mix asphalt (miscellaneous area) includes full compensation for furnishing all labor, tools, equipment, and incidentals, and for doing all the work involved in placing HMA (miscellaneous area) complete in place, including excavation, backfill, and preparation of the area to receive HMA (miscellaneous area), as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

If the Quality Control / Quality Assurance construction process is specified, HMA placed in dikes and miscellaneous areas is paid for at the contract price per ton for hot mix asphalt under Section 39-4, "Quality Control / Quality Assurance." Section 39-4.05B, "Statistical Evaluation, Determination of Quality Factors and Acceptance," does not apply to HMA placed in dikes and miscellaneous areas.

If there are no contract items for place hot mix asphalt dike and place hot mix asphalt (miscellaneous area) and the work is specified, full compensation for constructing HMA dikes and HMA (miscellaneous areas) including excavation, backfill, and preparation of the area to receive HMA dike or HMA (miscellaneous area) is included in the contract price paid per ton for the hot mix asphalt designated in the Engineer's Estimate and no separate payment will be made therefor.

The contract price paid per square yard for geosynthetic pavement interlayer of the type shown on the verified Bid Item List includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing geosynthetic pavement interlayer, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract price paid per ton for paving asphalt (binder, geosynthetic pavement interlayer) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying paving asphalt (binder, geosynthetic pavement interlayer), complete in place, including spreading sand to cover exposed binder material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Full compensation for small quantities of HMA placed on geosynthetic pavement interlayer to prevent displacement during construction is included in the contract price paid per ton for the HMA being paved over the interlayer and no separate payment will be made therefor.

The contract price paid per ton for tack coat includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying tack coat, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The Engineer does not adjust payment for increases or decreases in the quantities for tack coat, regardless of the reason for the increase or decrease. Section 4-1.03B, "Increased or Decreased Quantities," does not apply to the items for tack coat.

Full compensation for performing smoothness testing, submitting written and electronic copies of tests, and performing corrective work including applying fog seal coat is included in the contract price paid per ton for the HMA designated in the Engineer's Estimate and no separate payment will be made therefor.

Full compensation for spreading sand on RHMA-G, RHMA-O, and RHMA-O-HB surfaces and for sweeping and removing excess sand is included in the contract price paid per ton for rubberized hot mix asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.

If the dispute resolution ITP determines the Engineer's test results are correct, the Engineer deducts the ITP's testing costs from payments. If the ITP determines your test results are correct, the State pays the ITP's testing costs. If, in the Engineer's opinion, work completion is delayed because of incorrect Engineer test results, the Department makes payment and time adjustments under Section 8-1.09, "Delays."

^^

SECTION 40 PORTLAND CEMENT CONCRETE PAVEMENT
(Issued 01-20-12)

Replace Section 40 with:
SECTION 40 CONCRETE PAVEMENT

40-1 GENERAL

40-1.01 SUMMARY

Section 40 includes specifications for constructing concrete pavement on a prepared subgrade.

40-1.02 SUBMITTALS

40-1.02A Certificates of Compliance

Submit Certificates of Compliance under Section 6-1.07, "Certificates of Compliance." Include a test result report for any specified test with certification that test was performed within 12 months before the tested material's use.

Submit Certificates of Compliance for:

1. Tie bars
2. Threaded tie bar splice couplers
3. Dowel bars
4. Tie bar baskets
5. Dowel bar baskets
6. Chemical adhesive (drill and bond)
7. Silicone joint sealant
8. Asphalt rubber joint sealant
9. Preformed compression seal
10. Backer rods. Include the manufacturer's statement of compatibility with the sealant to be used.
11. Joint filler material
12. Curing compound. For each delivery to the job site, submit a copy of the Certificate of Compliance to the Engineer and the Transportation Laboratory. Each Certificate of Compliance must not represent more than 10,000 gallons and must include a test result report for:

    12.1. Moisture loss at 24 hours under California Test 534
    12.2. Reflectance under ASTM E 1347
    12.3. Viscosity under ASTM D 2196
    12.4. Nonvolatile content under ASTM D 2369
    12.5. Pigment content under ASTM D 3723
13. Epoxy powder coating

40-1.02B Curing Compound Samples

Submit split curing compound samples to the Transportation Laboratory.

40-1.02C Drilled Corings

Submit each core taken for Engineer's acceptance in a plastic bag. Mark each core with a location description.

40-1.02D Independent Third Party Air Content Testing Laboratory

Before testing, submit for the Engineer's approval the name of a laboratory that will test drilled core specimens for air content in cases of dispute.

40-1.02E Dowel Bars

Before placing dowel bars, submit a procedure for identifying transverse contraction joint locations relative to the dowel bars' longitudinal center and a procedure for consolidating concrete around the dowel bars.

40-1.02F Concrete Field Qualification

Submit field qualification data and test reports including:

1. Mixing date
2. Mixing equipment and procedures used
3. Batch volume in cubic yards
4. Type and source of ingredients used
5. Penetration of the concrete
6. Air content of the plastic concrete
7. Age and strength at time of concrete beam testing

Field qualification test reports must be certified with a signature by an official in responsible charge of the laboratory performing the tests.

40-1.02G Frequency Measuring Device (Tachometer)

Submit calibration documentation and operational guidelines for frequency measuring devices for concrete consolidation vibrators.

40-1.02H Manufacturer's Recommendations and Instructions

If used and at least 15 days before delivery to the job site, submit manufacturer's recommendations and instructions for storage and installation of:

1. Threaded tie bar splice couplers
2. Chemical adhesive (drill and bond)
3. Silicone liquid sealant
4. Asphalt rubber liquid sealant
5. Preformed compression seals
6. Joint filler material

40-1.02I Mix Proportions

At least 15 days before starting testing for mix proportions , submit a copy of the AASHTO accreditation for your laboratory determining the mix proportions. At least 30 days before starting field qualification, submit the proposed concrete mix proportions, the corresponding mix identifications, and laboratory test reports including the modulus of rupture for each trial mixture at 10, 21, 28, and 42 days.

40-1.02J Preformed Compression Seal

Submit the manufacturer's data sheet used to develop the recommended preformed compression seal based on the joint dimensions.

40-1.02K Concrete Pavement Early Age Crack Mitigation System

At least 24 hours before each paving shift, submit:

1. Early age stress and strength predictions
2. Scheduled sawing and curing activities
3. Contingency plan if volunteer cracking occurs

At least 24 hours before paving, meet with the Engineer to review the submittals for the early age crack mitigation system.

During paving, update the system with current weather data obtained from a portable weather station. Before paving concrete pavement with these updates, submit new stress and strength predictions and curing and sawing activity schedules.

40-1.02L Profilograms

Submit profilograms within 5 business days of initial profiling and within 2 business days of profiling corrected sections.

Submit 1 electronic copy of profile information in ".erd" format or other ProVAL compatible format to the Engineer and to:

Smoothness@dot.ca.gov

Submit the original of final profilograms before the Engineer accepts the contract.
Submitted profilograms become the Department's property.

40-1.02M Protecting Concrete Pavement During Cold Weather

Submit a plan for protecting concrete pavement during the initial 72 hours after paving when the forecasted minimum ambient temperature is below 40 degrees F.

40-1.02N Quality Control Charts

Submit updated quality control charts each paving day.

40-1.02O Quality Control Plan

At least 30 days before the start of field qualification, submit a concrete pavement quality control plan (QCP).

40-1.03 QUALITY CONTROL AND ASSURANCE

40-1.03A Contractor Quality Control Plan

Establish, implement, and maintain a QCP for concrete pavement. The QCP must describe the organization and procedures you use to:

1. Control the production process
2. Determine if changes to the production process are needed
3. Implement changes

The QCP must address the elements affecting concrete pavement quality including:

1. Mix proportions
2. Aggregate gradation
3. Materials quality
4. Stockpile management
5. Line and grade control
6. Proportioning
7. Mixing and transportation
8. Placing and consolidation
9. Contraction and construction joints
10. Dowel bar placement, alignment, and anchorage
11. Tie bar placement
12. Modulus of rupture
13. Finishing and curing
14. Surface smoothness
15. Joint sealant and compression seal installation

The QCP must include details of corrective action to be taken if any process is out of control. As a minimum, a process is out of control if any of the following occurs:

1. For fine and coarse aggregate gradation, 2 consecutive running averages of 4 tests are outside the specification limits
2. For individual penetration or air content measurements:

    2.1. One point falls outside the suspension limit line
    2.2. Two points in a row fall outside the action limit line

Stop production and take corrective action for out of control processes or the Engineer rejects subsequent material.

40-1.03B Quality Control Testing

Select random locations and perform sampling and testing in compliance with:

Quality Control Testing

Test	Frequency	Test Method
Cleanness value	2 per day	CT 227
Sand equivalent	2 per day	CT 217
Aggregate gradation	2 per day	CT 202
Air content (freeze thaw) [a]	1 per hour	CT 504
Air content (non-freeze thaw)	1 per 4 hours	CT 504
Density	1 per 4 hours	CT 518
Penetration	1 per 4 hours	CT 533
Calibration of moisture meter [b, c]	1 per day	CT 223 or CT 226

Notes:
[a] If air entrainment is specified, make at least 1 air content measurement per hour. If air entrainment is not specified, make at least 1 air content measurement per 4 hours.
[b] Make at least 1 measurement of moisture content per week to check the calibration of an electronically actuated moisture meter.
[c] Random location sampling and testing is not applicable.

If air entrainment is specified, the testing laboratory and tester must be qualified under the Department's Independent Assurance Manual. The manual is available from the Transportation Laboratory.

40-1.03C Control Charts

Maintain control charts to identify potential problems and assignable causes. Post a copy of each control chart at a location determined by the Engineer.

Individual measurement control charts must use the target values in the mix proportions as indicators of central tendency.

Develop linear control charts for:

1. Cleanness value
2. Sand equivalent
3. Fine and coarse aggregate gradation
4. Air content
5. Penetration

Control charts must include:

1. Contract number
2. Mix proportions
3. Test number
4. Each test parameter
5. Action and suspension limits
6. Specification limits
7. Quality control test results

For fine and coarse aggregate gradation control charts, record the running average of the previous 4 consecutive gradation tests for each sieve and superimpose the specification limits.

For penetration and air content control charts, record the individual measurements and superimpose the following action and suspension limits:

Penetration and Air Content Action and Suspension Limits

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Penetration, CT 533	1 inch	1-1/2 inch
Air content, CT 504	±1.0 percent	±1.5 percent

40-1.03D Contractor's Laboratory

Use a laboratory that complies with ASTM C 1077 to determine the mix proportions for concrete pavement. The laboratory must have a current AASHTO accreditation for:

1. AASHTO T 97 or ASTM C 78
2. ASTM C 192/C 192M

40-1.03E Joint Sealant and Compression Seal Installation Training

Before installing joint sealant or compression seals, arrange for a representative from the joint sealant or compression seal manufacturer to provide training on the cleaning and preparation of the joint and installing the sealant or seal. Until your personnel and the Department's personnel have been trained, do not install joint sealant or compression seals.

40-1.03F Frequency Measuring Device (Tachometer)

Before each day's concrete pavement placement and at intervals not to exceed 4 hours of production, test and record vibration frequency for concrete consolidation vibrators.

40-1.03G Early Age Concrete Pavement Crack Mitigation System

Develop and implement a system for predicting concrete pavement stresses and strength during the initial 72 hours after paving. The system must include:

1. Subscribing to a weather service to obtain forecasts for wind speed, ambient temperatures, humidity, and cloud cover
2. Portable weather station with anemometer, temperature and humidity sensors, located at the paving site
3. Early age concrete pavement stress and strength prediction computer program
4. Analyzing, monitoring, updating, and reporting the system's predictions

40-1.03H Curing Compound

Sample curing compound from shipping containers at the manufacturer's source of supply. Split the samples.

40-1.03I Concrete Pavement Smoothness

Within 10 days after paving, measure the Profile Index (PI_0) of the concrete pavement surface using a zero (null) blanking band under California Test 526.

For the following concrete pavement areas, the Engineer does not require a profilograph and you must test and correct high points determined by a 12-foot straightedge placed parallel with and perpendicular to the centerline:

1. Horizontal curves with a centerline radius of curvature less than 1,000 feet including concrete pavement within the superelevation transitions of those curves.
2. Exit ramp termini, truck weigh stations, and weigh-in-motion areas
3. Where steep grades and superelevation rates greater than 6 percent are present on:

    3.1. Ramps
    3.2. Connectors

4. Turn lanes and areas around manholes or drainage transitions
5. Acceleration and deceleration lanes for at-grade intersections
6. Shoulders and miscellaneous gore areas

Use a California Profilograph to determine the concrete pavement profile. If the profilograph uses a mechanical recorder, use an electronic scanner to reduce the profilogram.

The profilograph operator must be qualified under the Department's Independent Assurance Manual. The manual is available from the Department's Materials Engineering and Testing Services Web site.

40-1.03J Profilograph Test Procedure

Notify the Engineer at least 2 business days before performing profilograph testing. Each day before performing profilograph testing, notify the Engineer of the start location. Perform profilograph testing in the Engineer's presence.

Before starting profilograph testing, remove foreign objects from the concrete pavement surface.

Before starting profilograph testing, calibrate the profilograph in the Engineer's presence. If the Engineer chooses not to be present during profilograph testing, you may perform the testing with the Engineer's written approval. Note the Engineer's absence on the profilogram.

Determine PI_0 values for the final concrete pavement surface of each 0.1-mile section of a traffic lane. Take 2 profiles 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 0.01 mile and is the result of an interruption to continuous concrete pavement surface must comply with the PI_0 specifications for a full section. Adjust the PI_0 for a partial section to reflect a full section.

Use stationing to locate vertical deviations greater than 0.3 inches. The profilogram stationing must be the same as the project stationing. Note 0.1-mile segments on the profilogram.

Label the profilogram with:

1. Contract number
2. County and route number
3. Stationing
4. Operator's name
5. Test date
6. Test number
7. Traffic direction
8. Traffic lane (numbered from left to right in direction of travel)
9. Test wheel path (left or right in direction of travel)
10. Test direction
11. Paving direction

40-1.03K Smoothness Corrective Action

Correct concrete pavement not complying with the Engineer's acceptance specifications for smoothness by grinding under Section 42-2, "Grinding."

Do not grind before:

1. Ten days after concrete pavement placement
2. The concrete has developed a modulus of rupture of at least 550 psi

Grind the entire lane width. When completed, the lane width must be uniform in texture and appearance. Square the corrected area's start and end normal to the paved surface's centerline.

Retest sections where corrections were made.

40-1.03L Acceptance Criteria

General

Concrete pavement is accepted based on the Department's testing for the concrete pavement quality characteristics shown in the following table:

Concrete Pavement Acceptance Testing

Quality Characteristic	Quantity	Test
28-day modulus of rupture	1,000 cubic yards	CT 523
Thickness	1,200 square yards for primary area measurements	CT 531
Dowel bar placement	700 square yards	Measurement
Tie bar placement	4,000 square yards	Measurement
Coefficient of friction	One day's paving	CT 342
Air content (freeze-thaw) [a]	One day's paving	CT 504

Note:
[a] Air content tests must be performed under California Test 504 if air entrainment is specified.

Pavement smoothness may be accepted based on the Department's testing. A single test represents no more than 0.1 mile.

Acceptance of modulus of rupture, thickness, dowel bar and tie bar placement, coefficient of friction, smoothness, and air content, does not constitute final concrete pavement acceptance.

.

Modulus of Rupture

The Engineer accepts concrete pavement for modulus of rupture on a lot basis. The minimum modulus of rupture for each lot is 570 psi at 28 days.

For each lot of concrete for concrete pavement:

1. Quantity must not exceed 1,000 cubic yards.
2. Department determines the modulus of rupture of test beams aged 10 days and 28 days.
3. Department calculates the modulus of rupture by averaging the individual test results of 2 beams aged for 28 days.

The Department provides molds and machines for modulus of rupture acceptance testing. Provide material and labor the Engineer may require.

Concrete Pavement Smoothness

If the Department tests for smoothness, the tests are performed under Section 40-1.03I, "Concrete Pavement Smoothness."

The Engineer accepts concrete pavement for smoothness in compliance with the following:

1. For tangents and horizontal curves having a centerline radius of curvature 2,000 feet or more, the PI_0 must be at most 2-1/2 inches per 0.1-mile section.
2. 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 PI_0 must be at most 5 inches per 0.1-mile section.
3. If using a profilograph to measure smoothness, the surface must not have individual high points greater than 0.3 inch.
4. If using a straightedge to measure smoothness, the surface must be within 0.02 foot of the straightedge's lower edge.

Profile index specifications apply to existing pavement within 50 feet of the transverse joint separating new concrete pavement and the existing pavement.

If the Department's profilograph test results do not match yours, the Engineer may order you to recalibrate your profilograph equipment and perform a retest. If your test results are inaccurate due to operator error, the Engineer may disqualify your profilograph operator. If the Engineer determines your test results are inaccurate, the Engineer does not make adjustments to payment or contract time for recalibrating, retesting, and delays.

Concrete Pavement Thickness

The Engineer accepts concrete pavement for thickness based on coring in the primary area, which is the area placed in 1 day for each thickness. Concrete pavement thickness must not be deficient by more than 0.05 foot.

After corrective grinding has been completed, core concrete pavement in the primary area under Section 40-3.16, "Obtaining Drilled Cores," at locations determined by the Engineer and in the Engineer's presence. The core specimen diameter must be 4 inches. To identify the limits of concrete pavement deficient in thickness by more than 0.05 foot, you may divide primary areas into secondary areas. Specifications that may affect concrete pavement thickness such as allowable tolerances for subgrade construction do not change the thickness specified for concrete pavement.

In each primary area, the Engineer measures concrete pavement thickness every 1,200 square yards and any remaining area. The Engineer measures cores under California Test 531 to the nearest 0.01 foot. Core at least 1 foot from existing, contiguous, and parallel concrete pavement not constructed as part of this contract.

You may request the Engineer make additional thickness measurements and use them to determine the average thickness variation. The Engineer determines the locations with random sampling methods.

If each thickness measurement in a primary area is less than 0.05 foot deficient, the Engineer calculates the average thickness deficiency in that primary area. The Engineer uses 0.02 foot for a thickness difference more than 0.02 foot over the specified thickness.

For each thickness measurement in a primary area deficient by more than 0.05 foot, the Engineer determines a secondary area where the thickness deficiency is more than 0.05 foot. The Engineer determines this secondary area

by measuring the thickness of each concrete pavement slab adjacent to the measurement found to be more than 0.05 foot deficient. The Engineer continues to measure the thickness until an area that is bound by slabs with thickness deficient by 0.05 foot or less is determined.

Slabs without bar reinforcement are defined as the areas bound by longitudinal and transverse joints and concrete pavement edges. Slabs with bar reinforcement are defined as the areas bound by longitudinal joints and concrete pavement edges and 15-foot lengths. Secondary area thickness measurements in a slab determine that entire slab's thickness.

The Engineer measures the remaining primary area thickness after removing the secondary areas from consideration for determining the average thickness deficiency.

The Engineer determines the slabs to remove and replace.

Required Use of Air-Entraining Admixtures

If air-entraining admixtures are specified, the Engineer may choose to accept concrete pavement for air content based on your air content quality control tests. The Engineer decides to use your air content quality control tests based on a *t*-test that determines the difference in the means of your test and the Engineer's verification tests. The Engineer calculates the t-value of the test data as follows:

$$t = \frac{\left|\overline{X}_c - \overline{X}_v\right|}{S_p\sqrt{\frac{1}{n_c} + \frac{1}{n_v}}} \qquad \text{and} \qquad S_p^2 = \frac{S_c^2(n_c - 1) + S_v^2(n_v - 1)}{n_c + n_v - 2}$$

where:

n_c = Number of your quality control tests (minimum of 6 required)
n_v = Number of verification tests (minimum of 2 required)
$\overline{X}_c$ = Mean of your quality control tests
$\overline{X}_v$ = Mean of the verification tests
S_p = Pooled standard deviation
(When $n_v = 1$, $S_p = S_c$)
S_c = Standard deviation of your quality control tests
S_v = Standard deviation of the verification tests (when $n_v > 1$)

The Engineer compares your quality control test results with the Department's verification test results at a level of significance of $\alpha = 0.01$. The Engineer compares the *t*-value to t_{crit}, determined from:

t_{crit}

degrees of freedom (n_c+n_v-2)	t_{crit} (for $\alpha = 0.01$)
1	63.657
2	9.925
3	5.841
4	4.604
5	4.032
6	3.707
7	3.499
8	3.355
9	3.250
10	3.169

If the *t*-value calculated is less than or equal to t_{crit}, your quality control test results are verified. If the *t*-value calculated is greater than t_{crit}, quality control test results are not verified.

If your quality control test results are not verified, core at least 3 specimens from concrete pavement under Section 40-3.16, "Obtaining Drilled Cores." The Engineer selects the core locations. Your approved third party independent testing laboratory must test these specimens for air content under ASTM C 457. The Engineer

compares these test results with your quality control test results using the *t*-test method. If your quality control test results are verified based on this comparison, the Engineer uses the quality control test results for acceptance of concrete pavement for air content. If your quality control test results are not verified based on this comparison, the Engineer uses the air content of core specimens determined under ASTM C 457 for acceptance.

Dowel Bar and Tie Bar Placement

Dowel bar alignment must comply with section 40-3.06. Tie bar alignment must comply with Section 40-3.05. Except for CRCP, core specimens for:

1. Dowel bar placement
2. Tie bar placement
3. Concrete consolidation

Obtain cores under Section 40-3.16, "Obtaining Drilled Cores." The Engineer determines the core locations. Each core must have a nominal diameter of 4 inches. Core each day's paving within 2 business days in compliance with:

1. One test for every 700 square yards of doweled concrete pavement or remaining fraction of that area. Each dowel bar test consists of 2 cores, 1 on each dowel bar end to expose both ends and allow measurement.
2. One test for every 4,000 square yards of concrete pavement with tie bars or remaining fraction of that area. Each tie bar test consists of 2 cores, 1 on each tie bar end to expose both ends and allow measurement.

If the tests indicate dowel or tie bars are not placed within the specified tolerances or if there are air voids around the dowel or tie bars, core additional specimens to determine the limits of unacceptable work.

The Engineer determines the slabs to remove and replace.

If the Engineer approves your request, slabs may remain in place with an adjustment in payment for:

1. Dowel bars with centers from ±2 inches to ±3 inches from the saw cut of a transverse contraction joint or with deficient concrete consolidation around the dowel bars
2. Tie bars placed outside their specified placement and position or with deficient concrete consolidation around the tie bars

Bar Reinforcing Steel

The Engineer accepts concrete pavement for bar reinforcing steel based on inspection before concrete placement.

Curing Compound

Curing compound sampled from shipping containers from the manufacturer's supply source or from the job site must match the test results for viscosity, nonvolatile content, and pigment content within the specified tolerances listed in the precision and bias statements for the test methods.

40-2 MATERIALS

40-2.01 CONCRETE

40-2.01A General

Concrete must comply with Section 90, "Portland Cement Concrete."

40-2.01B Aggregate

The specifications for reduction in Operating Range and Contract Compliance for cleanness value and sand equivalent specified under Section 90-2.02A, "Coarse Aggregate," and Section 90-2.02B, "Fine Aggregate," do not apply to concrete pavement.

Combined aggregate gradings must comply with Section 90-3, "Aggregate Gradings," and the difference between the percent passing the 3/8-inch sieve and the percent passing the No. 8 sieve must not be less than 16 percent of the total aggregate.

40-2.01C Cementitious Material

Concrete for concrete pavement must contain from 505 pounds to 675 pounds cementitious material per cubic yard. Determine the minimum cementitious materials content. Use your value for minimum cementitious material content for *MC* in equation 1 and equation 2 of section 90-1.02B(3).

40-2.01D Mix Proportions

Your laboratory determining mix proportions must determine the minimum cementitious materials content or the maximum water to cementitious materials ratio and:

1. You must make trial mixtures no more than 24 months before field qualification.
2. Modulus of rupture used to determine the minimum cementitious materials content or maximum water to cementitious materials ratio must be 570 psi at 28 days age and 650 psi at 42 days age.
3. Your laboratory must determine an increase in the cementitious materials content or a decrease in the water to cementitious materials ratio from the trial mixtures to ensure concrete pavement complies with the specifications.

If changing an aggregate supply source or the mix proportions, produce a trial batch and field-qualify the new concrete. The Engineer does not adjust contract time for performing sampling, testing, and qualifying new mix proportions or changing an aggregate supply source.

40-2.01E Field Qualification

Proposed mix proportions must be field qualified before you place concrete pavement. Use an American Concrete Institute (ACI) certified "Concrete Laboratory Technician, Grade I" to perform field qualification tests and calculations.

The Engineer accepts field qualification if five beams made and tested under California Test 523 comply with the following:

1. At a minimum, beams are tested at 10, 21, and 28 days of age
2. At your choice of age not later than 28 days, no single beam's modulus of rupture is less than 550 psi and the average modulus of rupture is at least 570 psi

40-2.02 TIE BARS

Tie bars must be deformed bars.

If the project is not shown to be in high desert or any mountain climate region, tie bars must be one of the following:

1. Epoxy-coated bar reinforcement. Bars must comply with Section 52-1.02B, "Epoxy-coated Reinforcement" except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.
3. Low carbon, chromium-steel bars complying with ASTM A 1035/A 1035M.

If the project is shown to be in high desert or any mountain climate region, tie bars must be one of the following:

1. Epoxy-coated bar reinforcement. Bars must comply with "Epoxy-coated Prefabricated Reinforcement" in the special provisions except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.

Fabricate, sample, and handle epoxy-coated deformed tie bars at the job site under ASTM D 3963/D 3963M and Section 52-1.02B, "Epoxy-coated Reinforcement."

Do not bend tie bars.

40-2.03 DOWEL BARS

40-2.03A General

Dowel bars must be plain bars. Fabricate, sample, and handle epoxy-coated dowel bars under ASTM D 3963/D 3963M and section 52-1.02B, "Epoxy-coated Reinforcement," except each sample must be 18 inches long.

If the project is not shown to be in high desert or any mountain climate region, dowel bars must be one of the following:

1. Epoxy-coated bars. Bars must comply with ASTM A 615/A 615M, Grade 40 or 60. Epoxy coating must comply with either (1) Section 52-1.02B, "Epoxy-coated Reinforcement" or (2) "Epoxy-coated Prefabricated Reinforcement" in the special provisions.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.
3. Low carbon, chromium-steel bars under ASTM A 1035/A 1035M.

If the project is shown to be in high desert or any mountain climate region, dowel bars must be one of the following:

1. Epoxy-coated bars. Bars must comply with ASTM A 615/A 615M, Grade 40 or 60. Epoxy coating must comply with "Epoxy-coated Prefabricated Reinforcement" in the special provisions.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.

40-2.03B Dowel Bar Lubricant

Dowel bar lubricant must be either (1) petroleum paraffin based or (2) curing compound no. 3. Paraffin-based lubricant must be either Dayton Superior DSC BB-Coat, Valvoline Tectyl 506, or an approved equal. Petroleum paraffin based lubricant must be factory-applied.

40-2.04 CURING COMPOUND

Curing compound must be curing compound (1) or (2) with white pigment under Section 90-7.01B, "Curing Compound Method."

Reflectance must be at least 60 percent when tested under ASTM E 1347.

40-2.05 CHEMICAL ADHESIVE (DRILL AND BOND)

Chemical adhesive for drilling and bonding dowels and tie bars must be prequalified. A list of prequalified chemical adhesives is available on the Department's Materials Engineering and Testing Services website. The prequalified list indicates the appropriate chemical adhesive system for the concrete temperature and installation conditions.

Each chemical adhesive system must clearly and permanently show the following:

1. Manufacturer's name
2. Model number of the system
3. Manufacture date
4. Batch number
5. Expiration date
6. Current International Conference of Building Officials Evaluation Report number
7. Directions for use
8. Warnings or precautions required by state and federal laws and regulations

40-2.06 DOWEL AND TIE BAR BASKETS

For dowel and tie bar baskets, wire must comply with ASTM A 82/A 82M and be welded under ASTM A 185/A 185M, Section 7.4. The minimum wire-size no. is W10. Use either U-frame or A-frame shaped assemblies.

If the project is not shown to be in high desert or any mountain climate region. Baskets may be epoxy-coated, and the epoxy coating must comply with either (1) Section 52-1.02B, "Epoxy-coated Reinforcement" or (2) "Epoxy-coated Prefabricated Reinforcement" in the special provisions.

If the project is shown to be in high desert or any mountain climate region, wire for dowel bar and tie bar baskets must be one of the following:

1. Epoxy-coated wire under "Epoxy-coated Prefabricated Reinforcement" in the special provisions
2. Stainless-steel wire. Wire must be descaled, pickled, and polished solid stainless-steel. Wire must comply with (1) the chemical requirements in ASTM A 276/A 276M, UNS Designation S31603 or S31803 and (2) the tension requirements in ASTM A 1022/ A 1022M.

Handle epoxy-coated tie bar and dowel bar baskets under ASTM D 3963/D 3963M and either (1) Section 52-1.02B, "Epoxy-coated Reinforcement" or (2) "Epoxy-coated Prefabricated Reinforcement" in the special provisions.

Fasteners must be driven fasteners under ASTM F 1667. Fasteners on lean concrete base or HMA must have a minimum shank diameter of 3/16 inch and a minimum shank length of 2-1/2 inches. For asphalt treated permeable base or cement treated permeable base, the shank diameter must be at least 3/16 inch and the shank length must be at least 5 inches.

Fasteners, clips, and washers must have a minimum 0.2-mil thick zinc coating applied either by electroplating or galvanizing.

40-2.07 BACKER RODS

Backer rods must be Type 1 under ASTM D 5249. Backer rod diameter must be at least 25 percent greater than the sawcut joint width. Backer rod material must be expanded, crosslinked, closed-cell polyethylene foam. No bond or adverse reaction may occur between the backer rod and sealant.

40-2.08 JOINT FILLER MATERIAL

Joint filler for isolation joints must be preformed expansion joint filler for concrete (bituminous type) under ASTM D 994.

40-2.09 HYDRAULIC CEMENT GROUT (NON-SHRINK)

Hydraulic cement grout (non-shrink) must comply with ASTM C 1107/ C 1107M. Use clean, uniform, rounded aggregate filler to extend the grout. Aggregate filler must not exceed 60 percent of the grout mass or the maximum recommended by the manufacturer, whichever is less. Aggregate filler moisture content must not exceed 0.5 percent. Aggregate filler must comply with:

Aggregate Filler Grading

Sieve Size	Percentage Passing
1/2-inch	100
3/8-inch	85 - 100
No. 4	10 - 30
No. 8	0 - 10
No. 16	0 - 5

40-2.10 BAR REINFORCEMENT

Bar reinforcement must be deformed bars.

If the project is not shown to be in high desert or any mountain climate region, bar reinforcement must comply with section 52.

If the project is shown to be in high desert or any mountain climate regions, bar reinforcement must be one of the following:

1. Epoxy-coated bar reinforcement under section 52-2.03B except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60. Bars must be handled under ASTM D 3963/D 3963M and section 52-2.02C.
2. Low carbon, chromium steel bar complying with ASTM A 1035/A 1035M

40-2.11 JOINT SEALANT

40-2.11A General

Do not use hot-pour sealant that will melt the backer rod.

40-2.11B Silicone Joint Sealant

Silicone joint sealant must be prequalified. A list of prequalified silicone joint sealant available on the Department's Materials Engineering and Testing Services Web site at:
http://www.dot.ca.gov/hq/esc/approved_products_list/

40-2.11C Asphalt Rubber Joint Sealant

Asphalt rubber joint sealant must:

1. Be a mixture of paving asphalt and ground rubber containing not less than 22 percent ground rubber by weight. One hundred percent of ground rubber must pass a No. 8 sieve. Ground rubber must be vulcanized or a combination of vulcanized and devulcanized materials.
2. Comply with ASTM D 6690, Type II except:

    2.1. The cone penetration requirement must not exceed 120 at 77 F, 5 ounces, 5 seconds.
    2.2. The resilience requirement must be a minimum 50 percent recovery when tested at 77 F.

3. Have a Ring and Ball softening point of 135 °F minimum when tested under AASHTO T 53.
4. Be capable of being melted and applied to cracks and joints at temperatures below 400 °F.
5. Not be applied when the concrete pavement surface temperature is below 50 °F.

40-2.11D Preformed Compression Joint Seals

Preformed compression joint seals must comply with ASTM D 2628. Lubricant adhesive used with the seals must comply with ASTM D 2835. Preformed compression joint seals must have 5 or 6 cells, except seals for Type A2 and Type B joints may have 4 cells. Install preformed compression joint seals in compliance with the manufacturer's recommendations. Show evidence that the seals are compressed from 30 to 50 percent for the joint width at the time of installation.

40-2.12 WATER

Water for core drilling may be obtained from a potable water source, or submit proof that it does not contain:

1. More than 1,000 parts per million of chlorides as Cl
2. More than 1,300 parts per million of sulfates as $S0_4$
3. Impurities that cause pavement discoloration or surface etching

40-3 CONSTRUCTION

40-3.01 WATER SUPPLY

Before placing concrete pavement, develop enough water supply for the work.

40-3.02 SUBGRADE PREPARATION

Immediately before placing concrete, the subgrade to receive concrete pavement must be:

1. In compliance with the specified compaction and elevation tolerances
2. Free of loose and extraneous material
3. Uniformly moist, but free of standing or flowing water
4. Excavated for thickened parts of concrete pavement end anchors with no disturbed compaction outside the end anchor dimensions

If cement treated permeable base is specified, cover the base surface with asphaltic emulsion before placing concrete pavement. Apply the asphaltic emulsion uniformly at a rate of 0.1 gallons per square yard. Asphaltic emulsion must comply with anionic slow-setting type, SS1h grade in Section 94, "Asphaltic Emulsions." Repair damaged asphaltic emulsion before placing concrete pavement.

40-3.03 PROPORTIONING

Proportion aggregate and bulk cementitious materials under Section 90-5, "Proportioning."

40-3.04 PLACING CONCRETE

40-3.04A General

Place concrete pavement with stationary side forms or slip-form paving equipment.

Place consecutive concrete loads within 30 minutes of each other. Construct a transverse construction joint when concrete placement is interrupted by more than 30 minutes. The transverse construction joint must coincide with the next contraction joint location, or you must remove fresh concrete pavement to the preceding transverse joint location.

Place concrete pavement in full slab widths separated by construction joints or monolithically in multiples of full lane widths with a longitudinal contraction joint at each traffic lane line.

Do not retemper concrete.

If the concrete pavement surface width is constructed as specified, you may construct concrete pavement sides on a batter not flatter than 6:1 (vertical:horizontal).

40-3.04B Concrete Pavement Widening

If concrete pavement is placed adjacent to existing pavement not constructed as part of the contract, grind the existing concrete pavement lane or shoulder adjacent to the new concrete pavement. Perform the grinding before new concrete pavement is placed. The new concrete pavement must match the elevation of the existing concrete pavement after grinding. Grind existing concrete pavement under Section 42-2, "Grinding," except profile index must comply with the pavement smoothness specifications in Section 40-1.03, "Quality Control and Assurance."

Use paving equipment with padded crawler tracks or rubber-tired wheels on the existing concrete pavement with enough offset to avoid breaking or cracking the existing concrete pavement's edge.

40-3.04C Concrete Pavement Transition Panel

For concrete pavement placed in a transition panel, texture the surface with a drag strip of burlap, a broom, or a spring steel tine device that produces scoring in the finished surface. The scoring must be either parallel with or transverse to the centerline. For the method you choose, texture at the time that produces the coarsest texture.

40-3.04D Stationary Side Form Construction

Stationary side forms must be straight and without defects including warps, bends, and indentations. Side forms must be metal except at end closures and transverse construction joints where other materials may be used.

You may build up side forms by attaching a section to the top or bottom. If attached to the top of metal forms, the attached section must be metal.

The side form's base width must be at least 80 percent of the specified concrete pavement thickness.

Side forms including interlocking connections with adjoining forms must be rigid enough to prevent springing from subgrading and paving equipment and concrete pressure.

Construct subgrade to final grade before placing side forms. Side forms must bear fully on the foundation throughout their length and base width. Place side forms to the specified grade and alignment of the finished concrete pavement's edge. Support side forms during concrete placing, compacting, and finishing.

After subgrade work is complete and immediately before placing concrete, true side forms and set to line and grade for a distance that avoids delays due to form adjustment.

Clean and oil side forms before each use.

Side forms must remain in place for at least 1 day after placing concrete and until the concrete pavement edge no longer requires protection from the forms.

Spread, screed, shape, and consolidate concrete with 1 or more machines. The machine must uniformly distribute and consolidate the concrete. The machines must operate to place the concrete pavement to the specified cross section with minimal hand work.

Consolidate the concrete without segregation. If vibrators are used:

1. The vibration rate must be at least 3,500 cycles per minute for surface vibrators and 5,000 cycles per minute for internal vibrators
2. Amplitude of vibration must cause perceptible concrete surface movement at least 1 foot from the vibrating element
3. Use a calibrated tachometer for measuring frequency of vibration
4. Vibrators must not rest on side forms or new concrete pavement
5. Power to vibrators must automatically cease when forward or backward motion of the paving machine is stopped

Use high-frequency internal vibrators within 15 minutes of depositing concrete on the subgrade to uniformly consolidate the concrete across the paving width including adjacent to forms. Do not use vibrators to shift the mass of concrete.

40-3.04E Slip-Form Construction

If slip-form construction is used, spread, screed, shape, and consolidate concrete to the specified cross section with slip-form machines and minimal hand work. Slip-form paving machines must be equipped with traveling side forms and must not segregate the concrete.

Do not deviate from the specified concrete pavement alignment by more than 0.1 foot.

Slip-form paving machines must use high frequency internal vibrators to consolidate concrete. You may mount vibrators with their axes parallel or normal to the concrete pavement alignment. If mounted with axes parallel to the concrete pavement alignment, space vibrators no more than 2.5 feet measured center to center. If mounted with axes normal to the concrete pavement alignment, space the vibrators with a maximum 0.5-foot lateral clearance between individual vibrators.

Each vibrator must have a vibration rate from 5,000 cycles per minute to 8,000 cycles per minute. The amplitude of vibration must cause perceptible concrete surface movement at least 1 foot from the vibrating element. Use a calibrated tachometer to measure frequency of vibration.

40-3.05 TIE BAR PLACEMENT

Place tie bars in compliance with the tolerances shown in the following table:

Tie Bar Tolerance

Dimension	Tolerance
Horizontal and vertical skew	10 degrees maximum
Longitudinal translation	±2 inch maximum
Horizontal offset (embedment)	±2 inch maximum
Vertical depth	1. Not less than 1/2 inch below the saw cut depth of joints 2. When measured at any point along the bar, not less than 2 inches clear of the pavement's surface and bottom

Install tie bars at longitudinal joints by 1 of the following methods:

1. Drill concrete and bond tie bars with chemical adhesive in compliance with the manufacturer's instructions. Clean and dry drilled holes before placing chemical adhesive and tie bars. After inserting tie bars into chemical adhesive, support the bars to prevent movement during curing. If the Engineer rejects a tie bar installation, cut the tie bar flush with the joint face and coat the exposed end of the tie bar with chemical adhesive under Section 40-2, "Materials." Offset new holes 3 inches horizontally from the rejected hole's center.
2. Insert tie bars into plastic slip-formed concrete before finishing. Inserted tie bars must have full contact between the bar and the concrete. If tie bars are inserted through the plastic concrete surface, eliminate evidence of the insertion by reworking the concrete over the tie bars.
3. Use threaded tie bar splice couplers fabricated from deformed bar reinforcement free of external welding or machining.
4. Use tie bar baskets. Anchor baskets at least 200 feet in advance of concrete pavement placement activity. If you request a waiver, describe the construction limitations or restricted access preventing the advanced anchoring. After the baskets are anchored and before paving, demonstrate the tie bars do not move from their specified depth and alignment during paving. Use fasteners to anchor tie bar baskets.

If tie bars are not placed correctly, stop paving activities until you demonstrate to the Engineer correction of the cause.

40-3.06 DOWEL BAR PLACEMENT

Center dowel bars within 2 inches in the longitudinal direction on transverse contraction joints or construction joints.

If using curing compound as lubricant, apply the curing compound to dowels in 2 separate applications. Lubricate each dowel bar entirely with bond breaker before placement. The last application must be applied not more than 8 hours before placing the dowel bars. Apply each curing compound application at a rate of 1 gallon per 150 square feet.

If dowel bars are placed by mechanical insertion, eliminate evidence of the insertion by reworking the concrete over the dowel bars. If drilling and bonding dowel bars at construction joints, use a grout retention ring.

If using dowel bar baskets, anchor them with fasteners.

Use at least 10 fasteners for basket sections greater than 12 feet and less than or equal to 16 feet. Baskets must be anchored at least 200 feet in advance of the concrete placement activity unless the Engineer approves your waiver request. If requesting a waiver, describe the construction limitations or restricted access preventing the advanced anchoring. After the baskets are anchored and before the concrete is placed, cut and remove temporary spacer wires and demonstrate the dowel bars do not move from their specified depth and alignment during concrete placement.

Place dowel bars in compliance with:

Dowel Bar Tolerances

Dimension	Tolerance
Horizontal offset	±1 inch
Longitudinal translation	±2 inches
Horizontal skew	3/8 inch, max
Vertical skew	3/8 inch, max
Vertical depth	The minimum distance below the concrete pavement surface must be: DB = d/3 + 1/2 inch where: DB = vertical distance in inches, measured from concrete pavement surface to any point along the top of dowel bar d = concrete pavement thickness in inches The maximum distance below the depth shown must be 5/8 inch..

If dowel bars are not placed correctly, stop paving activities until you demonstrate to the Engineer correction of the cause.

Remove and replace the concrete pavement 3 feet on either side of a joint with a rejected dowel bar.

40-3.07 BAR REINFORCEMENT

Place bar reinforcement under Section 52, "Reinforcement." Bar reinforcement must be more than 1/2 inch below the saw cut depth at concrete pavement joints.

40-3.08 JOINTS

40-3.08A General

Concrete pavement joints consist of:

1. Longitudinal and transverse construction joints
2. Longitudinal and transverse contraction joints
3. Isolation joints

Construction joints must be normal to the concrete pavement surface.

Until contract acceptance and except for joint filler material, keep joints free of foreign material including soil, gravel, concrete, or asphalt mix.

Volunteer cracks are cracks not coincident with constructed joints.

Repair concrete pavement damaged during joint construction under Section 40-3.17B, "Repair of Spalls, Raveling, and Tearing."

Do not bend tie bars or reinforcement in existing concrete pavement joints.

40-3.08B Construction Joints

Construction joints form where fresh concrete is placed against hardened concrete, existing pavements, or structures.

Before placing concrete at construction joints, apply a curing compound under Section 90-7.01B, "Curing Compound Method," to the vertical surface of existing or hardened concrete and allow it to dry.

Use a metal or wooden bulkhead to form transverse construction joints. If dowel bars are specified, the bulkhead must allow dowel bar installation.

40-3.08C Contraction Joints

In multilane monolithic concrete pavement, use the sawing method to construct longitudinal contraction joints. Construct transverse contraction joints by the sawing method.

Construct transverse contraction joints within 1 foot of their specified spacing. If a slab length of less than 5 feet would be formed, adjust the transverse contraction joint spacing.

Construct transverse contraction joints across the full concrete pavement width regardless of the number or types of longitudinal joints crossed. In areas of converging and diverging pavements, space transverse contraction joints so their alignment is continuous across the full width where converging and diverging pavements are contiguous. Longitudinal contraction joints must be parallel with the concrete pavement centerline. Transverse and longitudinal contraction joints must not deviate by more than 0.1 foot from either side of a 12-foot straight line, except for longitudinal joints parallel to a curving centerline.

40-3.08D Isolation Joints

Construct isolation joints by saw cutting a minimum 1/8-inch width to full concrete pavement depth at the existing concrete pavement's edge and removing the concrete to expose a flat vertical surface. Before placing concrete, secure joint filler material that prevents new concrete from adhering to the existing concrete face.

Dispose of concrete saw cutting residue under Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way."

40-3.08E Sawing Method

The sawing method is cutting a groove in the concrete pavement with a power driven concrete saw. Grooves for longitudinal and transverse contraction joints must be the minimum width possible for the type of saw used. If necessary, the top of the joint must be sawn wider to provide space for joint sealant. Immediately wash slurry from the joint with water under 100 psi maximum pressure.

Saw longitudinal and transverse contraction joints before volunteer cracking occurs and after the concrete is hard enough to saw without spalling, raveling, or tearing.

To keep foreign material out of grooves before joint sealant or compression seal installation, you may use joint filler in sawed contraction joints. Joint filler must not react adversely with the concrete or cause concrete pavement damage. After sawing and washing a joint, install joint filler material that keeps moisture in the adjacent concrete during the 72 hours after paving. If you install joint filler material, the specifications for spraying the sawed joint with additional curing compound under Section 40-3.13, "Curing," do not apply. If using absorptive filler material, moisten the filler immediately before or after installation.

40-3.09 JOINT SEALANT AND COMPRESSION SEAL INSTALLATION

40-3.09A General

At least 7 days after concrete pavement placement and not more than 4 hours before installing joint sealant or compression seal materials, use dry sand blasting and other methods to clean the joint walls of objectionable material such as soil, asphalt, curing compound, paint, and rust. The maximum sand blasting nozzle diameter must be 1/4 inch. The minimum pressure must be 90 psi. Sand blast each side of the joint at least once, in at least 2 separate passes. Hold the nozzle at an angle to the joint from 1 to 2 inches from the concrete pavement. Using a vacuum, collect sand, dust, and loose material at least 2 inches on each side of the joint. Remove surface moisture and dampness at the joints with compressed air that may be moderately hot.

Before you install joint sealant or compression seal, the joint wall must be free of moisture, residue, or film.

If grinding or grooving over or adjacent to sealed joints, remove joint sealant or compression seal materials and dispose of them under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way." After grinding or grooving, replace the joint sealant or compression seal materials.

40-3.09B Liquid Sealant

Do not install liquid sealant in construction joints.

Install backer rods when the concrete pavement temperature is above the air dew point and when the air temperature is at least 40 °F.

Install liquid sealant immediately after installing the backer rod. Install sealant using a mechanical device with a nozzle shaped to introduce the sealant from inside the joint. Extrude sealant evenly and with continuous contact with the joint walls. Recess the sealant surface after placement. Remove excess sealant from the concrete pavement surface.

Do not allow traffic over sealed joints until the sealant is set.

40-3.09C Preformed Compression Seal

Install preformed compression seal in construction or isolation joints when specified in the special provisions.

Install longitudinal seals before transverse seals. Longitudinal seals must be continuous except splicing is allowed at intersections with transverse seals. Transverse seals must be continuous for the entire transverse length of concrete pavement except splices are allowed for widenings and staged construction. With a sharp instrument, cut across the longitudinal seal at the intersection with transverse construction joints. If the longitudinal seal does not relax enough to properly install the transverse seal, trim the longitudinal seal to form a tight seal between the 2 joints.

If splicing is authorized, splicing must comply with the manufacturer's written instructions.

Use a machine specifically designed for preformed compression seal installation. The machine must install the seal:

1. To the specified depth
2. To make continuous contact with the joint walls
3. Without cutting, nicking, or twisting the seal
4. With less than 4 percent stretch

Lay a length of preformed compression seal material cut to the exact length of the pavement joint to be sealed. The Engineer measures this length. After you install the length of preformed compression joint sealant, the Engineer measures the excess amount of material at the joint end. The Engineer divides the excess amount length by the original measured length to determine the percentage of stretch.

40-3.10 SHOULDER RUMBLE STRIP

If specified, construct shoulder rumble strips by rolling or grinding indentations in new concrete pavement.

Select the method and equipment for constructing ground-in indentations.

Do not construct shoulder rumble strips on structures or approach slabs.

Construct rumble strips within 2 inches of the specified alignment. Roller or grinding equipment must be equipped with a sighting device enabling the operator to maintain the rumble strip alignment.

Indentations must not vary from the specified dimensions by more than 1/16 inch in depth or more than 10 percent in length and width.

The Engineer orders grinding or removal and replacement of noncompliant rumble strips to bring them within specified tolerances. Ground surface areas must be neat and uniform in appearance.

The grinding equipment must be equipped with a vacuum attachment to remove residue.

Dispose of removed material under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way."

40-3.11 PRELIMINARY FINISHING

40-3.11A General

Preliminary finishing must produce a smooth and true-to-grade finish. After preliminary finishing, mark each day's concrete pavement with a stamp. The stamp must be approved by the Engineer before paving starts. The stamp must be approximately 1' x 2' in size. The stamp must form a uniform mark from 1/8 to 1/4 inch deep. Locate the mark 20 feet ± 5 feet from the transverse construction joint formed at each day's start of paving and 1 foot ± 0.25 foot from the concrete pavement's outside edge. The stamp mark must show the month, day, and year of placement and the station of the transverse construction joint. Orient the stamp mark so it can be read from the concrete pavement's outside edge.

Do not apply more water to the concrete pavement surface than can evaporate before float finishing and texturing are completed.

40-3.11B Stationary Side Form Finishing

If stationary side form construction is used, give the concrete a preliminary finish by the machine float method or the hand method.

If using the machine float method:

1. Use self-propelled machine floats.
2. Determine the number of machine floats required to perform the work at a rate equal to the concrete delivery rate. When the time from concrete placement to machine float finishing exceeds 30 minutes, stop concrete delivery . When machine floats are in proper position, you may resume concrete delivery and paving.
3. Machine floats must run on side forms or adjacent concrete pavement lanes. If running on adjacent concrete pavement, protect the adjacent concrete pavement surface under Section 40-3.15, "Protecting Concrete Pavement."
4. Floats must be hardwood, steel, or steel-shod wood. Floats must be equipped with devices that adjust the underside to a true flat surface.

If using the hand method, finish concrete smooth and true to grade with manually operated floats or powered finishing machines.

40-3.11C Slip-Form Finishing

If slip-form construction is used, the slip-form paver must give the concrete pavement a preliminary finish. You may supplement the slip-form paver with machine floats.

Before the concrete hardens, correct concrete pavement edge slump in excess of 0.02 foot exclusive of edge rounding.

40-3.12 FINAL FINISHING

After completing preliminary finishing, round the edges of the initial paving widths to a 0.04-foot radius. Round transverse and longitudinal construction joints to a 0.02-foot radius.

Before curing, texture the pavement. Perform initial texturing with a burlap drag or broom device that produces striations parallel to the centerline. Perform final texturing with a steel-tined device that produces grooves parallel with the centerline.

Construct longitudinal grooves with a self-propelled machine designed specifically for grooving and texturing concrete pavement. The machine must have tracks to maintain constant speed, provide traction, and maintain accurate tracking along the pavement surface. The machine must have a single row of rectangular spring steel tines. The tines must be from 3/32 to 1/8 inch wide, on 3/4-inch centers, and must have enough length, thickness, and resilience to form grooves approximately 3/16 inch wide. The machine must have horizontal and vertical controls. The machine must apply constant down pressure on the pavement surface during texturing. The machines must not cause ravels.

Construct grooves over the entire pavement width in a single pass except do not construct grooves 3 inches from the concrete pavement edges and longitudinal joints. Final texture must be uniform and smooth. Use a guide to properly align the grooves. Grooves must be parallel and aligned to the pavement edge across the pavement width. Grooves must be from 1/8 to 3/16 inch deep after concrete has hardened.

For irregular areas and areas inaccessible to the grooving machine, you may hand-construct grooves in compliance with the hand method under Section 40-3.11B, "Stationary Side Form Finishing." Hand-constructed grooves must comply with the specifications for machine-constructed grooves.

Initial and final texturing must produce a coefficient of friction of at least 0.30 when tested under California Test 342. Notify the Engineer when the concrete pavement is scheduled to be opened to traffic to allow at least 25 days for the Department to schedule for test for coefficient of friction. Notify the Engineer when the pavement is ready for testing which is the latter of:

1. Seven days after concrete placement
2. When the concrete pavement has attained a modulus of rupture of 550 psi

The Department tests for coefficient of friction within 7 days of receiving notification that the pavement is ready for testing.

Do not open the concrete pavement to traffic unless the coefficient of friction is at least 0.30.

Correct concrete pavement not complying with the Engineer's acceptance criteria for coefficient of friction by grooving or grinding under Section 42, "Groove and Grind Pavement."

Do not grind before:

1. Ten days after concrete pavement placement
2. Concrete has developed a modulus of rupture of at least 550 psi

Before opening to traffic, allow at least 25 days for the Department to retest sections for coefficient of friction after corrections are made.

40-3.13 CURING

Cure the concrete pavement's exposed area with waterproof membrane or curing compound (1) or (2) under Section 90-7.01, "Methods of Curing." When side forms are removed within 72 hours of the start of curing, also cure the concrete pavement edges.

If curing compound is used, apply it with mechanical sprayers. Reapply curing compound to sawcuts and disturbed areas.

40-3.14 EARLY USE OF CONCRETE PAVEMENT

If requesting early use of concrete pavement:

1. Furnish molds and machines for modulus of rupture testing
2. Sample concrete
3. Fabricate beam specimens
4. Test for modulus of rupture under California Test 523

When you request early use, concrete pavement must have a modulus of rupture of at least 350 psi. Protect concrete pavement under Section 40-3.15, "Protecting Concrete Pavement."

40-3.15 PROTECTING CONCRETE PAVEMENT

Protect concrete pavement under Section 90-8, "Protecting Concrete."

Maintain the concrete pavement temperature at not less than 40 °F for the initial 72 hours.

Protect the concrete pavement surface from activities that cause damage and reduce texture and coefficient of friction. Do not allow soil, gravel, petroleum products, concrete, or asphalt mixes on the concrete pavement surface.

Construct crossings for traffic convenience. If the Engineer approves your request, you may use rapid strength concrete for crossings. Do not open crossings until the Department determines by California Test 523 the concrete pavement's modulus of rupture is at least 550 psi.

Do not open concrete pavement to traffic or use equipment on the concrete pavement for 10 days after paving nor before the concrete has attained a modulus of rupture of 550 psi except:

1. If the equipment is for sawing contraction joints
2. If the Engineer approves your request, one side of paving equipment's tracks may be on the concrete pavement after a modulus of rupture of 350 psi has been attained, provided:

    2.1. Unit pressure exerted on the concrete pavement by the paver does not exceed 20 psi
    2.2. You change the paving equipment tracks to prevent damage or the paving equipment tracks travel on protective material such as planks
    2.3. No part of the track is closer than 1 foot from the concrete pavement's edge

If concrete pavement damage including visible cracking occurs, stop operating paving equipment on the concrete pavement and repair the damage.

40-3.16 OBTAINING DRILLED CORES

Drill concrete pavement cores under ASTM C 42/ C 42M. Core drilling equipment must use diamond impregnated bits.

Clean, dry, and fill core holes with hydraulic cement grout (non-shrink) or pavement concrete. Coat the core hole walls with epoxy under the specifications for epoxy adhesive for bonding new concrete to old concrete in Section 95, "Epoxy." The backfill must match the adjacent concrete pavement surface elevation and texture.

Do not allow residue from core drilling to fall on traffic, flow across shoulders or lanes occupied by traffic, or flow into drainage facilities including gutters.

40-3.17 REPAIR, REMOVAL, AND REPLACEMENT

40-3.17A General

Working cracks are full-depth cracks essentially parallel to a planned contraction joint beneath which a contraction crack has not formed. If the Engineer orders, take 4-inch nominal diameter cores on designated cracks under Section 40-3.16, "Obtaining Drilled Cores."

40-3.17B Repair of Spalls, Raveling, and Tearing

Before concrete pavement is open to traffic, repair spalls, raveling, and tearing in sawed joints. Make repairs in compliance with the following:

1. Saw a rectangular area with a diamond-impregnated blade at least 2 inches deep.
2. Remove unsound and damaged concrete between the saw cut and the joint and to the saw cut's depth. Do not use a pneumatic hammer heavier than 15 pounds. Do not damage concrete pavement to remain in place.
3. Dispose of removed concrete pavement under Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way."
4. Clean the repair area's exposed surfaces with high pressure abrasive water blasting. Further clean and dry the exposed surfaces with compressed air free of moisture and oil.
5. Apply epoxy as specified for epoxy resin adhesive for bonding new concrete to old concrete under Section 95, "Epoxy." Apply the epoxy with a stiff bristle brush.
6. Apply a portland cement concrete or mortar patch immediately following the epoxy application. Install an insert to prevent bonding of the sides of planned joints.

Repair spalls if they are:

1. Deeper than 0.05 foot
2. Wider than 0.04 foot
3. Longer than 0.3 foot

40-3.17C Route and Seal Working Cracks

Treat working cracks within 0.5 foot of either side of a planned contraction joint in compliance with the following:

1. Route and seal the crack with epoxy resin in compliance with the following:

    1.1. Use a powered rotary router mounted on wheels, with a vertical shaft and a routing spindle that casters as it moves along the crack
    1.2. Form a reservoir 3/4 inch deep by 3/8 inch wide in the crack
    1.3. Use equipment that does not cause raveling or spalling
    1.4. Place liquid sealant

2. Treat the contraction joint adjacent to the working crack in compliance with the following:

    2.1. Use epoxy resin under ASTM C 881/C 881M, Type IV, Grade 2 for Type B joints and secondary saw cuts for Type A1 and Type A2 joints
    2.2. Pressure inject epoxy resin under ASTM C 881/C881M, Type IV, Grade 1 for narrow saw cuts including initial saw cuts for Type A1 and Type A2 joints

If a working crack intersects a contraction joint, route and seal the working crack and seal the contraction joint as specified for installing liquid sealant under Section 40-3.09, "Joint Seal and Joint Sealant Installation."

40-3.17D Removal and Replacement of Slabs

As specified, remove and replace slabs or partial slabs for:

1. Insufficient thickness
2. Dowel bar misalignment
3. Working cracks more than 0.5 foot from a planned contraction joint

40-4 MEASUREMENT AND PAYMENT

40-4.01 MEASUREMENT

Concrete pavement is measured by the cubic yard. The Engineer calculates the pay quantity volume based on the dimensions shown on the plans and as ordered

The contract items for sealing joints as designated in the Verified Bid Item List are measured by the linear foot. Sealing joints are measured from field measurements for each type of sealed joint.

The contract item for shoulder rumble strips is measured by the station along each shoulder on which the rumble strips are constructed without deductions for gaps between indentations.

40-4.02 PAYMENT

The contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the concrete pavement, complete in place including bar reinforcement, tie bars, dowel bars, anchors, fasteners, tack coat, and providing the facility for and attending the prepaving conference, as shown on the plans and as specified in these specifications and the special provisions, and as directed by the Engineer.

The Engineer adjusts payment for each primary area deficient in average thickness in compliance with the following:

Pay Adjustments for Deficient Thickness

Average Thickness Deficiency (foot)	Deficiency Adjustment ($/sq yd)
0.01	0.90
0.02	2.30
0.03	4.10
0.04	6.40
0.05	9.11

If the average thickness deficiency is less than 0.01 foot, the Engineer does not adjust payment for thickness deficiency. If the average thickness deficiency is more than 0.01 foot, the Engineer rounds to the nearest 0.01 foot and uses the adjustment table.

Full compensation for core drilling and backfilling the cores ordered by the Engineer for measuring concrete pavement thickness and determining full-depth cracks is included in the contract price paid per cubic yard for concrete pavement as designated in the Engineer's Estimate and no additional compensation will be allowed therefor. The Department does not pay for additional concrete pavement thickness measurements requested by the Contractor.

The Department does not pay for the portion of concrete that penetrates treated permeable base.

Full compensation for the quality control plan is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no separate payment will be made therefor.

Full compensation for furnishing and applying asphaltic emulsion on cement treated permeable base is included in the contract price paid per cubic yard for concrete pavement as designated in the Engineer's Estimate and no separate payment will be made therefor.

Full compensation for repairing joints is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no separate payment will be made therefor.

Full compensation for furnishing, calibrating, and operating profilograph equipment for Profile Index, for submitting profilograms, and for performing corrective work is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no separate payment will be made therefor.

Full compensation for grooving and grinding for final finishing is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no separate payment will be made therefor.

Full compensation for removing and replacing joint material for grooving and grinding is included in the contract price per cubic yard for concrete pavement as designated in the Verified Bid Item List and no separate payment will be made therefor.

Full compensation for removing and replacing slabs is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no separate payment will be made therefor.

Full compensation for drilling holes and bonding tie bars with chemical adhesive is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no additional compensation will be allowed therefor.

Full compensation for repairing damage caused by operating paving equipment on new concrete pavement is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no separate payment will be made therefor.

The material and work necessary for the construction of crossings for public convenience, and their subsequent removal and disposal, will be paid for at the contract prices for the items of work involved and if there are no contract items for the work involved, payment for concrete pavement crossings will be made by extra work as specified in Section 4-1.03D, "Extra Work."

The Department will reduce payments to the Contractor by $56.12 per square yard for concrete pavement slabs allowed to remain in place represented by cores indicating dowel bars placed with their centers from ±2 inches to ±3 inches from the saw cut of a transverse contraction joint

The Engineer will calculate the reduced payment using the slab dimensions adjacent to and inclusive of the joints with misplaced dowel bars. This reduced payment is in addition to other specified payment reductions.

The Department will reduce payments to the Contractor by $59.56 per square yard for concrete pavement allowed to remain in place represented by cores indicating either of the following:

1. Tie bars placed outside their specified placement and position tolerances
2. Bar reinforcement placed outside their specified placement and position tolerances

The Engineer will calculate the reduced payment using the slab dimensions adjacent to and inclusive of the joints with misplaced tie bars. This reduced payment is in addition to other specified payment reductions.

Full compensation for core drilling for checking dowel or tie bar alignment and backfilling the cores is included in the contract price paid per cubic yard for concrete pavement as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are out of tolerance for alignment and the Engineer orders additional dowel or tie bar coring, full compensation for drilling the additional cores is included in the contract price paid per cubic yard for concrete pavement as designated in the Verified Bid Item List and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars or tie bars are within alignment tolerances and the Engineer orders more dowel or tie bar coring, the additional cores will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

The Department will not pay for additional coring to check dowel or tie bar alignment you request.

Full compensation for performing profilograph tests, furnishing the profilograms and electronic files to the Engineer, and for performing corrective work is included in the contract price paid per cubic yard for the type of concrete pavement as designated in the Verified Bid Item List and no additional compensation will be allowed therefor.

The contract prices paid per linear foot for seal pavement joint and seal isolation joint include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing pavement joints and sealing isolation joints, complete in place, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract price paid per station for shoulder rumble strip includes full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing the rumble strip complete in place, as shown on the plans, as specified in these Standard Specifications and as directed by the Engineer.

^^

SECTION 41 PAVEMENT SUBSEALING AND JACKING
(Issued 01-05-07)

In Section 41-1.02 replace the 2nd and 3rd paragraphs with:

Cement for grout shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

Fly ash shall conform to the requirements in AASHTO Designation: M 295 for either Class C or for Class F. The brand of fly ash used in the work shall conform to the provisions for approval of admixture brands in Section 90-4.03, "Admixture Approval."

In Section 41-1.02 replace the 5th paragraph with:

Chemical admixtures and calcium chloride may be used. Chemical admixtures in the grout mix shall conform to the provisions in Section 90-4, "Admixtures." Calcium chloride shall conform to ASTM Designation: D 98.

^^

SECTION 42 GROOVE AND GRIND PAVEMENT
(Issued 05-15-09)

In Section 42-2.02 replace the 3rd paragraph with:

Existing portland cement concrete pavement not constructed as part of the project shall be ground as follows:

> Grinding shall be performed so that the pavement surface on both sides of all transverse joints and cracks has essentially the same depth of texture and does not vary from a true plane enough to permit a 0.006-foot thick shim 0.25-foot 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 centerline with its midpoint at the joint or crack. After grinding has been completed, the pavement shall conform to the straightedge and profile requirements specified in Section 40-1.03, "Quality Control and Assurance."
> Abnormally depressed areas due to subsidence or other localized causes will be excluded from testing with the profilograph and 12-foot straightedge specified in Section 40-1.03. The accumulated total of the excluded areas shall not exceed 5 percent of the total area to be ground. Profilograph testing shall end 25 feet prior to excluded areas and shall resume 25 feet following the excluded areas.

In Section 42-2.03 replace the 2nd paragraph with:

Replacement concrete paving shall conform to the provisions in Section 40, "Concrete Pavement." Replacement pavement may be spread and shaped by any suitable powered finishing machines, supplemented by handwork as necessary. Consolidation of the concrete shall be by means of high-frequency internal vibrators within 15 minutes after the concrete is deposited on the subgrade. Vibrating shall be done with care and in such manner to assure adequate consolidation adjacent to forms and uniformly across the full paving width. Use of vibrators for extensive shifting of the mass of concrete will not be permitted. Methods of spreading, shaping and compacting that result in segregation, voids or rock pockets shall be discontinued, and the Contractor shall adopt methods which will produce dense homogeneous pavement conforming to the required cross section. Finishing may be performed by hand method, as specified in Section 40-3.11B, "Stationary Side Form Finishing."

^^

SECTION 49 PILING
(Issued 07-20-12)

In Section 49-1.03 replace the 4th paragraph with:

Modification to the specified installation methods and specified pile tip elevation will not be considered at locations where settlement, tension demands, or lateral load demands control design pile tip elevations or when the plans state that specified pile tip elevation shall not be revised.

In Section 49-1.03 in the 7th paragraph, replace the 2nd sentence with:

The loading apparatus described as "Tensile Load Applied by Hydraulic Jack(s) Acting Upward at One End of Test Beam(s)" shall not be used.

In Section 49-1.03 replace the 9th paragraph with:

The Contractor shall furnish piling of sufficient length to obtain the specified tip elevation shown on the plans or specified in the special provisions.

In Section 49-1.04 replace the 6th paragraph with:

The Contractor may use additional cementitious material in the concrete for the load test and anchor piles.

In Section 49-4.01 replace the 2nd paragraph with:

The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles shall be prequalified in conformance with the provisions in Section 90-9, "Compressive Strength," and shall have a minimum 28-day compressive strength of 3,600 psi. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the one-inch maximum grading, the 1/2-inch maximum grading, or the 3/8-inch maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

In Section 49-6.01 replace the 1st paragraph with:

The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of driven shells filled with concrete, shall be measured along the longest side, from the tip elevation shown on the plans to the plane of pile cut-off.

In Section 49-6.02 add:

When pile tips are revised by the Engineer for timber, steel, and precast prestressed concrete piles, and for cast-in-place concrete piles consisting of driven shells filled with concrete, the additional length required, including all materials, equipment, and labor for furnishing, splicing, and installing the piling, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

^^

SECTION 50 PRESTRESSING CONCRETE
(Issued 04-20-12)

In Section 50-1.02 replace the 2nd paragraph with:

The working drawings of the prestressing system shall show complete details and substantiating calculations of the method and materials the Contractor proposes to use in the prestressing operations, including any additions or rearrangement of reinforcing steel from that shown on the plans. The details shall outline the method and sequence of stressing and shall include complete specifications and details of the prestressing steel and anchoring devices, jacking stresses, elongation calculations, type of ducts and all other data pertaining to the prestressing, including the proposed arrangement of the prestressing steel in the members. The drawings shall also show (1) the exact location of anchorage system components, ducts, and other related elements and (2) the duct location data, including elevations at least every 1/8th point of the span for each span.

In Section 50-1.05 replace the 1st paragraph with:

Prestressing steel shall be high-tensile wire conforming to the requirements in ASTM Designation: A 421, including Supplement I; high-tensile seven-wire strand conforming to the requirements in ASTM Designation: A 416; or uncoated deformed (Type II) high-strength steel bars conforming to the requirements in ASTM Designation: A 722, including all supplementary requirements. The maximum weight requirement of ASTM Designation: A 722 will not apply.

In Section 50-1.05 in the 3rd paragraph, delete item A.

In Section 50-1.05 in the 3rd paragraph, replace item E with:

E. In addition to the requirements in Section 50-1.10, "Samples for Testing," four 4-foot-long samples of coated strand and one 5-foot-long sample of uncoated strand of each size and reel shall be furnished to the Engineer for testing. These samples, as selected by the Engineer, shall be representative of the material to be used in the work.

In Section 50-1.05 between the 3rd and 4th paragraphs, add:

The Contractor shall furnish to the Transportation Laboratory a representative 8-ounce sample from each batch of epoxy patching material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.

In Section 50-1.07 replace the 2nd paragraph with:

Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of the welded seam will not be required. Ducts shall have sufficient strength to maintain their correct alignment during placing of concrete. Joints between sections of duct shall be positive metallic connections which do not result in angle changes at the joints. Waterproof tape shall be used at the connections. Ducts shall be bent without crimping or flattening. Transition couplings connecting the ducts to anchoring devices shall be either ferrous metal or polyolefin. Ferrous metal transition couplings need not be galvanized.

Ducts shall have an inside cross-sectional area of at least:

1. 2.5 times the net area of the prestressing steel for multistrand tendons that will be placed by the pull-through method.
2. 2.0 times the net area of the prestressing steel for multistrand tendons that will not be placed by the pull-through method.

Ducts shall have an outside diameter not exceeding 50 percent of the girder web width.

In Section 50-1.07 replace the 7th paragraph with:

All ducts having a vertical duct profile change of 6 inches or more shall be vented. Vents shall be placed within 6 feet of every high point in the duct profile. Vents shall be 1/2 inch minimum diameter standard pipe or suitable plastic pipe. Connections to ducts shall be made with metallic or plastic structural fasteners. Plastic components, if selected, shall not react with the concrete or enhance corrosion of the prestressing steel and shall be free of water soluble chlorides. The vents shall be mortar tight, taped as necessary, and shall provide means for injection of grout through the vents and for sealing the vents. Ends of vents shall be removed one inch below the roadway surface after grouting has been completed.

In Section 50-1.08 replace the 2nd paragraph with:

The maximum temporary tensile stress (jacking stress) in prestressing steel of post-tensioned members shall not exceed 75 percent of the specified minimum ultimate tensile strength of the prestressing steel.

In Section 50-1.08 delete the 4th, 5th, and 6th paragraphs.

In Section 50-1.08 replace the 11th paragraph with:

Prestressing forces shall not be applied to cast-in-place concrete until at least 10 days after the last concrete has been placed in the member to be prestressed and until the concrete compressive strength has reached the strength shown on the plans or specified in the specifications.

In Section 50-1.08 replace the 15th paragraph with:

When prestressing steel in pretensioned members is tensioned at a temperature appreciably lower than the estimated temperature of the concrete and the prestressing steel at the time of initial set of the concrete, the calculated elongation of the prestressing steel shall be increased to compensate for the loss in stress.

The maximum temporary tensile stress in the prestressing steel of pretensioned members shall not exceed 80 percent of the specified minimum ultimate tensile strength of the prestressing steel.

Pretensioned prestressing steel shall be anchored at stresses that will result in the ultimate retention of working forces at not less than those shown on the plans.

In Section 50-1.09 replace the 2nd and 3rd paragraphs with:

Grout shall consist of cement and water and may contain an admixture if approved by the Engineer.

Cement shall conform to the provisions in Section 90-2.01A, "Cement."

In Section 50-1.10 between the 3rd and 4th paragraphs, add:

Each sample shall be identified by location and Contract number with weatherproof markings. A completed Sample Identification Card shall also be attached to each sample. The card is available from the Transportation Laboratory.

In Section 50-1.10 in the 5th paragraph, replace item A with:

A. For wire or bars, one 7-foot-long sample and for strand, one 4-foot-long sample, of each size shall be furnished for each heat or reel.

In Section 50-1.11 replace the 1st paragraph with:

No separate payment will be made for pretensioning precast concrete members. Payment for pretensioning precast concrete members shall be considered as included in the contract price paid for furnish precast members as provided for in Section 51, "Concrete Structures."

^^

SECTION 51 CONCRETE STRUCTURES
(Issued 08-05-11)

In Section 51-1.05 in the 11th paragraph, replace the 1st sentence with:

Form panels for exposed surfaces shall be furnished and placed in uniform widths of not less than 3 feet and in uniform lengths of not less than 6 feet, except at the end of continuously formed surfaces where the final panel length required is less than 6 feet.

In Section 51-1.06A(3) in the 1st paragraph, replace items E and F with:

E. When timber members are used to brace falsework bents which are located adjacent to roadways or railroads, all connections for the timber bracing shall be of the bolted type using 5/8-inch diameter or larger bolts or coil rod with a root diameter equal to that of the shank of a 5/8-inch diameter bolt.

F. Falsework member clearances must be at least those shown in the following table:

Falsework member	Clearances	
	To railing members, barriers, and anchored temporary railings	To unanchored temporary railings
Footings	0'-3"	2'-0"
Piles	1'-0"	2'-9"
Other members	2'-0"	2'-9"

In Section 51-1.06C in the 11th paragraph, replace the 1st sentence with:

Falsework for box culverts and other structures with decks lower than the roadway pavement and with span lengths of 14 feet or less shall not be released until the last placed concrete has attained a compressive strength of 1,600 psi, provided that curing of the concrete is not interrupted.

In Section 51-1.11 replace the 6th paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 51-1.12D replace the 4th paragraph with:

Expanded polystyrene shall be a commercially available polystyrene board. Expanded polystyrene shall have a minimum flexural strength of 35 psi determined in conformance with the requirements in ASTM Designation: C 203 and a compressive yield strength of between 16 and 40 psi at 5 percent compression. Surfaces of expanded polystyrene against which concrete is placed shall be faced with hardboard. Hardboard shall be 1/8 inch minimum thickness, conforming to ANSI A135.4, any class. Other facing materials may be used provided they furnish equivalent protection. Boards shall be held in place by nails, waterproof adhesive, or other means approved by the Engineer.

In Section 51-1.12F replace the 3rd paragraph with:

Type A and AL joint seals shall consist of a groove in the concrete that is filled with field-mixed silicone sealant.

In Section 51-1.12F in the 6th paragraph, replace the table with:

Movement Rating (MR)	Seal Type
MR ≤ 1 inch	Type A or Type B
1 inch < MR ≤ 2 inches	Type B
2 inches < MR ≤ 4 inches	Joint Seal Assembly (Strip Seal)
MR > 4 inches	Joint Seal Assembly (Modular Unit) or Seismic Joint

In Section 51-1.12F(3)(a) replace the 1st and 2nd paragraphs with:

The sealant must consist of a 2-component silicone sealant that will withstand up to ±50 percent movement. Silicone sealants must be tested under California Test 435 and must comply with the following:

Specification	Requirement
Modulus at 150 percent elongation	8-75 psi
Recovery	21/32 inch max.
Notch Test	Notched or loss of bond 1/4 inch, max.
Water Resistance	Notched or loss of bond 1/4 inch, max.
Ultraviolet Exposure ASTM Designation: G 154, Table X2.1,Cycle 2.	No more than slight checking or cracking.
Cone Penetration	4.5-12.0 mm

In Section 51-1.12F(3)(a) delete the 3rd and 8th paragraphs.

In Section 51-1.12F(3)(a) replace the 10th paragraph with:

A Certificate of Compliance accompanied by a certified test report must be furnished for each batch of silicone sealant in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

In Section 51-1.12F(3)(b) replace the 2nd paragraph with:

The preformed elastomeric joint seal must conform to the requirements in ASTM D 2628 and the following:

1. The seal must consist of a multichannel, nonporous, homogeneous material furnished in a finished extruded form.
2. The minimum depth of the seal measured at the contact surface must be at least 95 percent of the minimum uncompressed width of the seal as designated by the manufacturer.
3. When tested in conformance with the requirements in California Test 673 for Type B seals, joint seals must provide a movement rating (MR) of not less than that shown on the plans.

4. The top and bottom edges of the joint seal must maintain continuous contact with the sides of the groove over the entire range of joint movement.
5. The seal must be furnished full length for each joint with no more than 1 shop splice in any 60-foot length of seal.
6. The Contractor must demonstrate the adequacy of the procedures to be used in the work before installing seals in the joints.
7. One field splice per joint may be made at locations and by methods approved by the Engineer. The seals are to be manufactured full length for the intended joint, then cut at the approved splice section and rematched before splicing. The Contractor must submit splicing details prepared by the joint seal manufacturer for approval before beginning splicing work.
8. Shop splices and field splices must have no visible offset of exterior surfaces and must show no evidence of bond failure.
9. At all open ends of the seal that would admit water or debris, each cell must be filled to a depth of 3 inches with commercial quality open cell polyurethane foam or closed by other means subject to approval by the Engineer.

In Section 51-1.12F(3)(b) replace the 7th paragraph with:

The joint seal must be installed full length for each joint with equipment that does not twist or distort the seal, elongate the seal longitudinally, or otherwise cause damage to the seal or to the concrete forming the groove.

In Section 51-1.12F(3)(b) in the 11th paragraph, replace the 1st sentence with:

Samples of the prefabricated joint seals, not less than 3 feet in length, will be taken by the Engineer from each lot of material.

In Section 51-1.12H(1) in the 6th paragraph, replace the 4th and 5th sentences with:

Each ply of fabric shall have a breaking strength of not less than 800 pounds per inch of width in each thread direction when 3" x 36" samples are tested on split drum grips. The bond between double plies shall have a minimum peel strength of 20 pounds per inch.

In Section 51-1.12H(1) in the 8th paragraph in the table, replace the hardness (Type A) requirements with:

Hardness (Type A)	D 2240 with 2kg mass.	55 ±5

In Section 51-1.12H(2) in the 1st paragraph in item A, replace the 1st and 2nd sentences with:

The bearings shall consist of alternating steel laminates and internal elastomer laminates with top and bottom elastomer covers. Steel laminates shall have a nominal thickness of 0.075 inch (14 gage).

In Section 51-1.13 replace the 2nd, 3rd, and 4th paragraphs with:

Surfaces of fresh concrete at horizontal construction joints shall be thoroughly consolidated without completely removing surface irregularities. Additionally, surfaces of fresh concrete at horizontal construction joints between girder stems and decks shall be roughened to at least a 1/4-inch amplitude.

Construction joint surfaces shall be cleaned of surface laitance, curing compound, and other foreign materials using abrasive blast methods before fresh concrete is placed against the joint surface.

Construction joint surfaces shall be flushed with water and allowed to dry to a surface dry condition immediately before placing concrete.

In Section 51-1.135 replace the 1st paragraph with:

Mortar shall be composed of cementitious material, sand, and water proportioned and mixed as specified in this Section 51-1.135.

In Section 51-1.135 replace the 3rd paragraph with:

The proportion of cementitious material to sand, measured by volume, shall be 1 to 2 unless otherwise specified.

In Section 51-1.17 in 4th paragraph, replace the 3rd sentence with:

The surfaces shall have a profile trace showing no high points in excess of 0.25 inch, and the portions of the surfaces within the traveled way shall have a profile count of 5 or less in any 100 foot section.

Add:

51-1.17A Deck Crack Treatment

The Contractor shall use all means necessary to minimize the development of shrinkage cracks.

The Contractor shall remove all equipment and materials from the deck and clean the surface as necessary for the Engineer to measure the surface crack intensity. Surface crack intensity will be determined by the Engineer after completion of concrete cure, before prestressing, and before the release of falsework. In any 500 square foot portion of deck within the limits of the new concrete deck, should the intensity of cracking be such that there are more than 50 feet of cracks whose width at any location exceeds 0.02 inch, the deck shall be treated with a high molecular weight methacrylate (HMWM) resin system. The area of deck to be treated shall have a width that extends for the entire width of new deck inside the concrete barriers and a length that extends at least 5 feet beyond the furthest single continuous crack outside the 500 square foot portion, measured from where that crack exceeds 0.02 inch in width, as determined by the Engineer.

Deck crack treatment shall include furnishing, testing, and applying the HMWM resin system, with sand and absorbent material. If grinding is required, deck crack treatment shall take place before grinding.

51-1.17A(1) Submittals

Submit a HMWM resin system placement plan. When HMWM resin is to be applied within 100 feet of a residence, business, or public space including sidewalks under a structure, also submit a public safety plan. Submit plans under Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The review time is 15 days.

The HMWM resin system placement plan must include:

1. Schedule of work and testing for each bridge
2. Description of equipment for applying HMWM resin
3. Range of gel time and final cure time for HMWM resin
4. Absorbent material to be used
5. Description of equipment for applying and removing excess sand and absorbent material
6. Procedure for removing HMWM resin from the deck, including equipment
7. Storage and handling of HMWM resin components and absorbent material
8. Disposal of excess HMWM resin and containers

The public safety plan must include:

1. A public notification letter with a list of delivery and posting addresses. The letter must state HMWM resin work locations, dates, times, and what to expect. Deliver the letter to residences and businesses within 100 feet of HMWM resin work locations and to local fire and police officials at least 7 days before starting work. Post the letter at the job site.
2. An airborne emissions monitoring plan prepared and executed by a certified industrial hygienist (CIH) certified in comprehensive practice by the American Board of Industrial Hygiene. The plan must have at least 4 monitoring points including the mixing point, application point, and point of nearest public contact. Monitor airborne emissions during HMWM resin work and submit emissions monitoring results after completing the work.
3. An action plan for protection of the public when airborne emissions levels exceed permissible levels.
4. A copy of the CIH's certification.

If the measures proposed in the safety plan are inadequate to provide for public safety associated with the use of HMWM resin, the Engineer will reject the plan and direct the Contractor to revise the plan. Directions for revisions will be in writing and include detailed comments. The Engineer will notify the Contractor of the approval or rejection of a submitted or revised plan within 15 days of receipt of that plan.

51-1.17A(2) Quality Control and Assurance

Submit samples of HMWM resin components 15 days before use under Section 6-3, "Testing," of the Standard Specifications. Notify the Engineer 15 days before delivery of HMWM resin components in containers over 55 gallons to the job site.

Complete a test area before starting work. Results from airborne emissions monitoring of the test area must be submitted to the Engineer before starting production work.

The test area must:

1. Be approximately 500 square feet
2. Be placed within the project limits outside the traveled way at an approved location
3. Be constructed using the same equipment as the production work
4. Replicate field conditions for the production work
5. Demonstrate proposed means and methods meet the acceptance criteria
6. Demonstrate production work will be completed within the time allowed
7. Demonstrate suitability of the airborne emissions monitoring plan

The test area will be acceptable if:

1. The treated deck surface is tack free and non-oily
2. The sand cover adheres and resists brushing by hand
3. Excess sand and absorbent material has been removed
4. The coefficient of friction is at least 0.35 when tested under California Test 342

51-1.17A(3) Materials

HMWM resin system consists of a resin, promoter, and initiator. HMWM resin must be low odor and comply with the following:

HMWM Resin

Property	Requirement	Test Method
Volatile Content*	30 percent, maximum	ASTM D 2369
Viscosity*	25 cP, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 77°F)	ASTM D 2196
Specific Gravity*	0.90 minimum, at 77°F	ASTM D 1475
Flash Point*	180°F, minimum	ASTM D 3278
Vapor Pressure*	1.0 mm Hg, maximum, at 77°F	ASTM D 323
Tack-free Time	400 minutes, maximum, at 25°C	Specimens prepared per California Test 551
PCC Saturated Surface-Dry Bond Strength	3.5 MPa, minimum at 24 hours and 21 ± 1°C	California Test 551

* Test must be performed before adding initiator.

Sand for abrasive sand finish must:

1. Be commercial quality dry blast sand
2. Have at least 95 percent pass the No. 8 sieve and at least 95 percent retained on the No. 20 sieve when tested under California Test 205

Absorbent material must be diatomaceous earth, abrasive blast dust, or substitute recommended by the HMWM resin supplier and approved by the Engineer.

51-1.17A(4) Construction

HMWM resin system applied by machine must be:

1. Combined in volumetric streams of promoted resin to initiated resin by static in-line mixers
2. Applied without atomization

HMWM resin system may be applied manually. Limit the quantity of resin mixed for manual application to 5 gallons at a time.

Prepare the area to be treated by abrasive blasting. Curing compound, surface contaminants, and foreign material must be removed from the bridge deck surface. Sweep the deck surface clean after abrasive blasting and blow loose material from cracks using high-pressure air.

The deck surface must be dry when abrasive blast cleaning is performed. When abrasive blast cleaning within 10 feet of public traffic, remove dust and residue from abrasive blast cleaning using a vacuum attachment operating concurrently with blasting equipment . If the deck surface becomes contaminated before placing HMWM, abrasive blast clean the contaminated area and sweep the deck clean.

The deck must be dry before applying HMWM resin. The concrete surface must be at least 50 degrees F and at most 100 degrees F. Relative humidity must be expected to be at most 85 percent during the work shift.

Thoroughly mix all components of the HMWM resin system. Apply HMWM resin to the deck surface within 5 minutes of mixing at approximately 90 sq ft per gallon. The Engineer determines the exact application rate. The resin gel time must be between 40 and 90 minutes. HMWM resin that thickens during application is rejected.

Spread the HMWM resin system uniformly. Completely cover surfaces to be treated and fill all cracks. Redistribute excess resin using squeegees or brooms within 10 minutes of application. For textured or grooved deck surfaces, excess resin must be removed from the texture indentations.

Apply the abrasive sand finish of at least 2 pounds per square yard or until saturation as determined by the Engineer no sooner than 20 minutes after applying resin. Apply absorbent material before opening lane to traffic. Remove excess sand and absorbent material by vacuuming or power sweeping.

Traffic or equipment will be allowed on the overlay after the Engineer has determined:

1. The treated deck surface is tack free and non-oily
2. The sand cover adheres and resists brushing by hand
3. Excess sand and absorbent material has been removed
4. No material will be tracked beyond limits of treatment by traffic

In Section 51-1.18C replace the 2nd paragraph with:

When Class 2 surface finish (gun finish) is specified, ordinary surface finish shall first be completed. The concrete surfaces shall then be abrasive blasted to a rough texture and thoroughly washed down with water. While the washed surfaces are damp, but not wet, a finish coating of machine applied mortar, approximately 1/4 inch thick, shall be applied in not less than 2 passes. The coating shall be pneumatically applied and shall consist of either (1) sand, cementitious material, and water mechanically mixed prior to its introduction to the nozzle, or (2) premixed sand and cementitious material to which water is added prior to its expulsion from the nozzle. The use of admixtures shall be subject to the approval of the Engineer as provided in Section 90, "Portland Cement Concrete." Unless otherwise specified, supplementary cementitious materials will not be required. The proportion of cementitious material to sand shall be not less than one to 4, unless otherwise directed by the Engineer. Sand shall be of a grading suitable for the purpose intended. The machines shall be operated and the coating shall be applied in conformance with standard practice. The coating shall be firmly bonded to the concrete surfaces on which it is applied.

In Section 51-1.18C replace the 5th paragraph with:

When surfaces to be finished are in pedestrian undercrossings, the sand shall be silica sand and the cementitious material shall be standard white portland cement.

In Section 51-1.23 add:

Full compensation for deck crack treatment, including the public safety plan, shall be considered as included in the contract price paid per cubic yard for structural concrete, bridge, and no additional compensation will be allowed therefor.

^^

SECTION 52 REINFORCEMENT
(Issued 06-05-09)

In Section 52-1.02(B) between the 3rd and 4th paragraphs, add:

The epoxy powder coating shall be selected from the Department's Pre-Qualified Products List.

In Section 52-1.02(B) replace the 14th paragraph with:

Except for lap splices, splices for epoxy-coated reinforcement shall be coated with a corrosion protection covering that is selected from the Department's Pre-Qualified Products List. The covering shall be installed in accordance with the manufacturer's recommendations.

In Section 52-1.07 in the 11th paragraph, replace the table with:

Height Zone (H) (Feet above ground)	Wind Pressure Value (psf)
$H \leq 30$	20
$30 < H \leq 50$	25
$50 < H \leq 100$	30
$H > 100$	35

In Section 52-1.08B(1) replace the 1st paragraph with:

Mechanical splices to be used in the work shall be selected from the Department's Pre-Qualified Products List.

In Section 52-1.08B(1) in the 2nd paragraph, replace the table with:

Reinforcing Bar Number	Total Slip
4	0.020-inch
5	0.020-inch
6	0.020-inch
7	0.028-inch
8	0.028-inch
9	0.028-inch
10	0.036-inch
11	0.036-inch
14	0.048-inch
18	0.060-inch

In Section 52-1.08B(1), in the 6th paragraph, delete item C.

In Section 52-1.08B(2) in the 6th paragraph, replace the subparagraph with:

The minimum preheat and interpass temperatures shall be 400º F for Grade 40 bars and 600º F for Grade 60 bars. Immediately after completing the welding, at least 6 inches of the bar on each side of the splice shall be covered by an insulated wrapping to control the rate of cooling. The insulated wrapping shall remain in place until the bar has cooled below 200º F.

Replace Section 52-1.08B(3) with:

52-1.08B(3) Resistance Butt Welds

Shop produced resistance butt welds shall be produced by a fabricator who is selected from the Department's Pre-Qualified Products List.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of splice material. The Certificate of Compliance shall include heat number, lot number and mill certificates.

In Section 52-1.08C replace the 3rd paragraph with:

Testing on prequalification and production sample splices shall be performed at an approved independent testing laboratory. The laboratory shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project.

The independent testing laboratory shall be selected from the Department's Pre-Qualified Products List.

In Section 52-1.08C replace the 5th paragraph with:

Prequalification and production sample splices and testing shall conform to California Test 670 and these specifications.

In Section 52-1.08C delete the 6th paragraph.

In Section 52-1.08C replace the 8th paragraph with:

Each sample splice, as defined herein, shall be identified as representing either a prequalification or production test sample splice.

In Section 52-1.08C in the 10th paragraph, delete the last sentence.

Replace Section 52-1.08C(1) with:

52-1.08C(1) Splice Prequalification Report

Before using any service splices or ultimate butt splices in the work, the Contractor shall submit a Splice Prequalification Report. The report shall include the following:

A. A copy of the manufacturer's product literature giving complete data on the splice material and installation procedures.
B. Names of the operators who will be performing the splicing.
C. Descriptions of the positions, locations, equipment, and procedures that will be used in the work.
D. Certifications from the fabricator for prequalification of operators and procedures based on sample tests performed no more than 2 years before submitting the report. Each operator shall be certified by performing 2 sample splices for each bar size of each splice type that the operator will be performing in the work. For deformation-dependent types of splice devices, each operator shall be certified by performing 2 additional samples for each bar size and deformation pattern that will be used in the work.

Prequalification sample splices shall be tested by an approved independent testing laboratory and shall conform to the appropriate production test criteria and slip requirements specified herein. When epoxy-coated reinforcement is required, resistance butt welded sample splices shall have the weld flash removed by the same procedure as will be used in the work, before coating and testing. The Splice Prequalification Report shall include the certified test results for all prequalification sample splices.

The QCM shall review and approve the Splice Prequalification Report before submitting it to the Engineer for approval. The Contractor shall allow 2 weeks for the review and approval of a complete report before performing any service splicing or ultimate butt splicing in the work.

In Section 52-1.08C(2)(a) replace the 1st, 2nd, 3rd, 4th, and 5th paragraphs with:

Production tests shall be performed by an approved independent testing laboratory for all service splices used in the work. A production test shall consist of testing 4 sample splices prepared for each lot of completed splices. The samples shall be prepared by the Contractor using the same splice material, position, operators, location, and equipment, and following the same procedure as used in the work.

At least one week before testing, the Contractor shall notify the Engineer in writing of the date and location where the testing of the samples will be performed.

The 4 samples from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the approved independent testing laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 samples of splices shall not be tested.

Before performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the requirements for total slip in Section 52-1.08B(1), "Mechanical Splices." Should this sample not meet the total slip requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of the 3 remaining samples not conform to the total slip requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.

Replace Section 52-1.08C(2)(b) with:

52-1.08C(2)(b) Quality Assurance Test Requirements for Service Splices

In addition to the required production tests, the Contractor shall concurrently prepare 4 service quality assurance sample splices for:

A. The first production test performed.
B. One of every 5 subsequent production tests, or fraction thereof, randomly selected by the Engineer.

These service quality assurance sample splices shall be prepared in the same manner as specified herein for service production sample splices.

The service quality assurance sample splices shall be shipped to the Transportation Laboratory for quality assurance testing. Each set of 4 sample splices shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 samples of splices will not be tested. Sample splices not accompanied by the supporting documentation required in Section 52-1.08B(1), "Mechanical Splices," for mechanical splices, or in Section 52-1.08B(3), "Resistance Butt Welds," for resistance butt welds, will not be tested.

Quality assurance testing will be performed in conformance with the requirements for service production sample splices in Section 52-1.08C(2)(a), "Production Test Requirements for Service Splices."

Replace Section 52-1.08C(3) with:

52-1.08C(3) Ultimate Butt Splice Test Criteria

Ultimate production and quality assurance sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370 and California Test 670.

Each sample splice shall be identified as representing a prequalification, production, or quality assurance sample splice.

The portion of hoop reinforcing bar, removed to obtain a sample splice, shall be replaced using a prequalified ultimate mechanical butt splice, or the hoop shall be replaced in kind.

Reinforcing bars, other than hoops, from which sample splices are removed, shall be repaired using ultimate mechanical butt splices conforming to the provisions in Section 52-1.08C(1), "Splice Prequalification Report," or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in any "No Splice Zone" shown on the plans.

Ultimate production and quality assurance sample splices shall rupture either: 1) in the reinforcing bar but outside of the affected zone, provided that the sample splice has visible necking or 2) anywhere, provided that the sample splice has achieved the strain requirement for necking.

When tested in conformance with the requirements in California Test 670, "Necking (Option I)," the visible necking shall be such that there is a visible decrease in the sample's cross-sectional area at the point of rupture.

When tested in conformance with the requirements in California Test 670, "Necking (Option II)," the strain requirement for necking shall be such that the largest measured strain is not less than 6 percent for No. 11 and larger bars, or not less than 9 percent for No. 10 and smaller bars.

The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice. The weld and one inch adjacent to the weld will be considered part of the affected zone.

In Section 52-1.08C(3)(a) replace the 1st paragraph with:

Production tests shall be performed for all ultimate butt splices used in the work. A production test shall consist of testing 4 sample splices removed from each lot of completed splices.

In Section 52-1.08C(3)(a) replace the 3rd paragraph with:

After notification has been received, the Engineer will randomly select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. These ultimate production sample splices shall be removed by the Contractor, and tested by an approved independent testing laboratory.

In Section 52-1.08(C)(3)(a) replace the 5th, 6th, and 7th paragraphs with:

A sample splice will be rejected if a tamper-proof marking or seal is disturbed before testing.

The 4 sample splices from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the approved independent testing laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sample splices shall not be tested.

Before performing any tensile tests on production test sample splices, one of the 4 sample splices shall be tested for, and shall conform to, the requirements for total slip in Section 52-1.08B(1), "Mechanical Splices." Should this sample splice not meet these requirements, one retest, in which the 3 remaining sample splices are tested for total slip, will be allowed. Should any of the 3 remaining sample splices not conform to these requirements, all splices in the lot represented by this production test will be rejected.

Replace Section 52-1.08C(3)(b) with:

52-1.08C(3)(b) Quality Assurance Test Requirements for Ultimate Butt Splices

In addition to the required production tests, the Contractor shall concurrently prepare 4 ultimate quality assurance sample splices for:

A. The first production test performed.
B. One of every 5 subsequent production tests, or fraction thereof, randomly selected by the Engineer.

These ultimate quality assurance sample splices shall be prepared in the same manner as specified herein for ultimate production sample splices.

The ultimate quality assurance sample splices shall be shipped to the Transportation Laboratory for quality assurance testing. Each set of 4 sample splices shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 samples of splices will not be tested. Sample splices not accompanied by the supporting documentation required in Section 52-1.08B(1), "Mechanical Splices," for mechanical splices, or in Section 52-1.08B(3), "Resistance Butt Welds," for resistance butt welds, will not be tested.

Quality assurance testing will be performed in conformance with the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."

Replace Section 52-1.08D with:

A Production Test Report for all testing performed on each lot shall be prepared by the approved independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each test: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, length of test specimen, physical condition of test sample splice, any notable defects, total measured slip, and ultimate tensile strength of each splice. In addition, the report shall include location of visible necking area and largest measured strain for ultimate butt splices.

The QCM must review, approve, and forward each Production Test Report to the Engineer for review before the splices represented by the report are encased in concrete. The Engineer will have 3 working days to review each Production Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection.

Quality assurance test results for each bundle of 4 samples of splices will be reported in writing to the Contractor within 3 working days after receipt of the bundle by the Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase splices before receiving notification from the Engineer, it is expressly understood that the

Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection.

^^

SECTION 53 SHOTCRETE
(Issued 11-02-07)

In Section 53-1.01 replace the 3rd paragraph with:

The dry-mix process shall consist of delivering dry mixed aggregate and cementitious material pneumatically or mechanically to the nozzle body and adding water and mixing the materials in the nozzle body. The wet-mix process shall consist of delivering mixed aggregate, cement, and water pneumatically to the nozzle and adding any admixture at the nozzle.

In Section 53-1.02 replace the 1st through 4th paragraphs with:

Cementitious material, fine aggregate, and mixing water shall conform to the provisions in Section 90, "Portland Cement Concrete."

Shotcrete to be mixed and applied by the dry-mix process shall consist of one part cementitious material to not more than 4.5 parts fine aggregate, thoroughly mixed in a dry state before being charged into the machine. Measurement may be either by volume or by weight. The fine aggregate shall contain not more than 6 percent moisture by weight.

Shotcrete to be mixed and applied by the wet-mix process shall consist of cementitious material, fine aggregate, and water and shall contain not less than 632 pounds of cementitious material per cubic yard. A maximum of 30 percent pea gravel may be substituted for fine aggregate. The maximum size of pea gravel shall be such that 100 percent passes the 1/2 inch screen and at least 90 percent passes the 3/8 inch screen.

Admixtures may be added to shotcrete and shall conform to the provisions in Section 90-4, "Admixtures."

In Section 53-1.04 in the 3rd paragraph, replace item C with:

C. Aggregate and cementitious material that have been mixed for more than 45 minutes shall not be used unless otherwise permitted by the Engineer.

Replace Section 53-1.07 with:

53-1.07 MEASUREMENT

Quantities of shotcrete will be measured by the cubic yard computed from measurements, along the slope, of actual areas placed and the theoretical thickness shown on the plans. The Department does not pay for shotcrete placed outside the dimensions shown on the plans or to fill low foundation.

Replace Section 53-1.08 with:

53-1.08 PAYMENT

The contract price paid per cubic yard for shotcrete shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing shotcrete, including preparing the foundation, wire reinforcement, structure backfill, joint filling material, and if required by the plans, drains with sacked pervious backfill material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

^^

SECTION 54 WATERPROOFING
(Issued 07-01-11)

In Section 54-1.02, replace the 1st paragraph with:

Waterproofing asphalt shall conform to the requirements in ASTM Designation: D 449, Type I for below ground and Type II for above ground.

^^

SECTION 55 STEEL STRUCTURES
(Issued 08-05-11)

In Section 55-1.01 replace the 4th paragraph with:

Design details, fabrication, and workmanship for steel railway bridges shall conform to the provisions in Chapter 15, "Steel Structures," of the AREMA Manual for Railway Engineering.

In Section 55-1.05 replace the 3rd paragraph with:

Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations."

In Section 55-2.01 replace the table in the 5th paragraph with:

Material Conforming to ASTM Designation: A 709/A 709M	CVN Impact Value (Ft. Lbs at Temp.)
Grade 36	15 at 40º F
Grade 50* (2 inches and under in thickness)	15 at 40º F
Grade 50W* (2 inches and under in thickness)	15 at 40º F
Grade 50* (Over 2 inches to 4 inches in thickness)	20 at 40º F
Grade 50W* (Over 2 inches to 4 inches in thickness)	20 at 40º F
Grade HPS 50W* (4 inches and under in thickness)	20 at 10º F
Grade HPS 70W (4 inches and under in thickness)	25 at -10º F
Grade 100 ($2^1/_2$ inches and under in thickness)	25 at 0º F
Grade 100W (Over $2^1/_2$ inches to 4 inches in thickness)	35 at 0º F

* If the yield point of the material exceeds 65,000 psi, the temperature for the CVN impact value for acceptability shall be reduced 15º F for each increment of 10,000 psi above 65,000 psi

In Section 55-2.01 replace the Structural Steel Materials table with:

Structural Steel Materials

Material	Specification
Structural steel:	
Carbon steel	ASTM: A 709/A 709M, Grade 36 or {A 36/A 36M}[a]
High strength low alloy columbium vanadium steel	ASTM: A 709/A 709M, Grade 50 or {A 572/A 572M, Grade 50}[a]
High strength low alloy structural steel	ASTM: A 709/A 709M, Grade 50W, Grade HPS 50W, or {A 588/A 588M}[a]
High strength low alloy structural steel plate	ASTM: A 709/A 709M, Grade HPS 70W
High-yield strength, quenched and tempered alloy steel plate suitable for welding	ASTM: A 709/A 709M, Grade 100 and Grade 100W, or {A 514/A 514M}[a]
Steel fastener components for general applications:	
Bolts and studs	ASTM: A 307
Anchor bolts	ASTM: F 1554 or A 307, Grade C
High-strength bolts and studs	ASTM: A 449, Type 1
High-strength threaded rods	ASTM: A 449, Type 1
High-strength nonheaded anchor bolts	ASTM: F 1554, Grade 105, Class 2A
Nuts	ASTM: A 563, including Appendix X1[b]
Washers	ASTM: F 844
Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM: A 325, Type 1
Tension control bolts	ASTM: F 1852, Type 1
Nuts	ASTM: A 563, including Appendix X1[b]
Hardened washers	ASTM : F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM: F 959, Type 325, zinc-coated
Carbon steel for forgings, pins and rollers	ASTM: A 668/A 668M, Class D
Alloy steel for forgings	ASTM: A 668/A 668M, Class G
Pin nuts	ASTM: A 36/A 36M
Carbon-steel castings	ASTM: A 27/A 27M, Grade 65-35, Class 1
Malleable iron castings	ASTM: A 47/A 47M, Grade 32510 (Grade 22010)
Gray iron castings	ASTM: A 48, Class 30B
Carbon steel structural tubing	ASTM: A 500, Grade B or A 501
Steel pipe (Hydrostatic testing will not apply)	ASTM: A 53, Type E or S, Grade B; A 106, Grade B; or A 139, Grade B
Stud connectors	AASHTO/AWS D1.5

a Grades that may be substituted for the equivalent ASTM Designation: A 709 steel, at the Contractor's option, subject to the modifications and additions specified and to the requirements of A 709.

b Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

In Section 55-2.04 delete the 1st paragraph.

Delete Section 55-2.05.

In Section 55-3.05 replace the 1st paragraph with:

Surfaces of bearing and base plates and other metal surfaces that are to come in contact with each other or with ground concrete surfaces shall be flat to within 1/32-inch tolerance in 12 inches and to within 1/16-inch tolerance overall. Surfaces of bearing and base plates and other metal bearing surfaces that are to come in contact with preformed fabric pads, elastomeric bearing pads, or mortar shall be flat to within 1/8-inch tolerance in 12 inches and to within 3/16-inch tolerance overall.

In Section 55-3.07 in the 1st paragraph, replace item B with:

B. The radius of bend measured to the concave face shall conform to the requirements in ASTM Designation: A6/A6M

In Section 55-3.10 in the 1st paragraph, replace item B with:

B. Internal threads shall conform to the requirements in ASTM Designation: A 563.

In Section 55-3.19 replace the 3rd paragraph with:

Immediately before setting bearing assemblies or masonry plates directly on ground concrete surfaces, the Contractor shall thoroughly clean the surfaces of the concrete and the metal to be in contact and shall apply a coating of nonsag polysulfide or polyurethane caulking conforming to the requirements in ASTM Designation: C 920 to contact areas to provide full bedding.

In Section 55-4.01 in the 1st paragraph, replace item D with:

D. To determine the pay quantities of galvanized metal, the weight to be added to the calculated weight of the base metal for the galvanizing will be determined from the table of weights of zinc coatings specified in ASTM Designation: A 153/A 153M.

^^

SECTION 56 SIGNS
(Issued 07-20-12)

In Section 56-1.01 in the 2nd paragraph, replace the 1st sentence with:

Sign structures shall be of the following types: truss, tubular, lightweight and bridge mounted.

In Section 56-1.02A replace the 1st paragraph with:

Bars and plates shall be structural steel complying with one or more of the following:

1. ASTM Designation: A36/A36M
2. ASTM Designation: A709/A709M, Grade 36 or 50
3. ASTM Designation: A572/A572M, Grade 50

Other open shapes shall be structural steel complying with one or more of the following:

1. ASTM Designation: A36/A36M
2. ASTM Designation: A709/A709M, Grade 36 or 50
3. ASTM Designation: A992/A992M

Light fixture mounting channel shall be a continuous slot channel made from one of the following:

1. Steel complying with ASTM Designation: A1011/A1011M, Designation SS, Grade 33
2. Extruded aluminum of alloy 6063-T6 complying with ASTM Designation: B221 or B221M

In Section 56-1.02B delete the 2nd paragraph.

In Section 56-1.02E replace the 1st paragraph with:

Pipe posts shall be welded or seamless steel pipe conforming to the requirements in ASTM Designation: A 53/A 53M, Grade B; ASTM Designation: A 106/A 106M, Grade B; or API Specification 5L PSL2 Grade B or Grade X42R or Grade X42M. At the option of the Contractor, posts may be fabricated from structural steel conforming to the requirements in ASTM Designation: A 36/A 36M.

Pipe posts shall not be spiral seam welded.

In Section 56-1.02F replace item B of the 1st paragraph with:

B. Material for gratings shall be structural steel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation CS, Type B or Designation SS, Grade 36, Type 1.

In Section 56-1.03 replace the 5th paragraph with:

Clips, eyes, or removable brackets shall be affixed to all signs and all posts and shall be used to secure the sign during shipping and for lifting and moving during erection as necessary to prevent damage to the finished galvanized or painted surfaces. Brackets on tubular sign structures shall be removed after erection. Details of the devices shall be shown on the working drawings.

In Section 56-1.03 delete the 12th paragraph.

In Section 56-1.05 replace the 1st paragraph with:

Excepting tubular type, all ferrous metal parts of sign structures shall be galvanized and not painted, unless otherwise specified in the special provisions.

In Section 56-1.05 replace the 2nd paragraph with:

Except as herein provided, all exterior surfaces including those areas to be covered by sign panels of tubular type of sign structures shall be cleaned and painted as provided in Section 59-5, "Painting Sign Structures," and as provided in the special provisions. There shall be no chemical treatment of galvanized surfaces prior to cleaning and painting. Walkway gratings, walkway brackets, gutters, safety railings, steel mountings for light fixtures, and all nuts, bolts, and washers for sign structures shall be galvanized after fabrication and shall not be painted.

In Section 56-1.05 replace the 3rd paragraph with:

Galvanizing shall conform to the provisions in Section 75-1.05, "Galvanizing," except that when permission is granted by the Engineer, surfaces may be coated with zinc by the metalizing process. Metalizing shall be performed in conformance with the AWS requirements. The thickness of the sprayed zinc coat shall be 10 ± 2 mils. The thickness of the sprayed zinc coat on faying surfaces shall not be more than 10 mils.

In Section 56-1.05, add:

Zinc solders or zinc alloys that contain tin shall not be used to repair a damaged galvanized surface.

In Section 56-1.07, add:

Bridge-mounted signs shall not be fastened to concrete elements of bridges or railings before the concrete attains a compressive strength of 2,500 psi.

In Section 56-1.10 replace the 4th paragraph with:

The contract price paid per pound for install sign structure of the type or types designated in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing sign structures, complete in place, including installing anchor bolt assemblies, removable sign panel frames, and sign panels and performing any welding, painting or galvanizing required during installation, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

In Section 56-2.03 replace the 4th paragraph with:

Backfill material for metal posts shall consist of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," and shall contain not less than 463 pounds of cementitious material per cubic yard.

^^

SECTION 59 PAINTING
(Issued 10-19-12)

In Section 59-1.01 add:

Coatings selected for use shall conform to the volatile organic compound limits specified for the air quality district where the project is located.

In Section 59-1.03 replace the 3rd paragraph with:

Painting shall be done in a neat and workmanlike manner. Unless otherwise specified, paint shall be applied by brush, or spray, or roller, or any combination of these methods. Gun extensions shall not be used.

In Section 59-1.03 replace the 5th paragraph with:

Unless otherwise specified, should 7 days elapse between paint applications, the painted surface shall be pressure rinsed prior to the next paint application. Pressure rinsing is defined as a pressurized water rinse with a minimum nozzle pressure of 1,160 psi. During rinsing, the tip of the pressure nozzle shall be placed between 12 inches and 18 inches from the surface to be rinsed. The nozzle shall have a maximum fan tip angle of 30°.

In Section 59-2.01 replace the 2nd paragraph with:

Unless otherwise specified, no painting Contractors or subcontractors will be permitted to perform work without having the following current "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council) certifications in good standing throughout the duration of the contract:

A. For cleaning and painting structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors (Field Application to Complex Industrial Structures)" (SSPC-QP 1).
B. For removing paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure for the Qualification of Painting Contractors (Field Removal of Hazardous Coatings from Complex Structures)" (SSPC-QP 2, Category A).
C. For cleaning and painting structural steel in a permanent painting facility, certification in conformance with the requirements in AISC-420-10/SSPC-QP 3, "Certification Standard for Shop Application of Complex Protective Coating Systems." All cleaning and painting of structural steel shall be performed in an Enclosed Shop.

In Section 59-2.03 replace the 3rd paragraph with:

Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular anchor pattern of not less than 1.5 mil as measured in conformance with the requirements in ASTM Designation: D 4417.

Replace Section 59-2.05 with:

59-2.05 CLEANING PAINTED SURFACES

All previously painted surfaces shall be cleaned by pressure washing or steam cleaning before other cleaning or painting activities are performed. Gloss on the existing paint shall be removed without removing sound paint. Areas

of gloss remaining after cleaning shall be roughened using 100 to 200-grit sandpaper. Any paint that becomes loose, curled, lifted, or that loses its bond after cleaning shall be removed to sound paint or metal.

Pressure washing includes cleaning surfaces using a pressure wash system with a nozzle pressure from 2,500 to 5,000 psi and a maximum fan tip angle of 45 degrees.

Steam cleaning includes cleaning dirt, grease, loose chalky paint, and other foreign material from surfaces using steam. The steam temperature at the nozzle shall be from 265 to 375 degrees F. A biodegradable detergent shall be used during steam cleaning. After steam cleaning, cleaned surfaces shall be rinsed clean with fresh water. Steam cleaning shall not be performed more than 2 weeks before painting or other phases of cleaning. Steam-cleaned surfaces shall not be painted until they are thoroughly dry and 24 hours have elapsed after steam cleaning.

In Section 59-2.12 replace the 3rd and 4th paragraphs with:

Contact surfaces of stiffeners, railings, built up members or open seam exceeding 6 mils in width that would retain moisture, shall be caulked with polysulfide or polyurethane sealing compound conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O, or other approved material.

The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements in SSPC-PA 2, "Measurement of Dry Coating Thickness with Magnetic Gages," of the "SSPC: The Society for Protective Coatings," except that there shall be no limit to the number or location of spot measurements to verify compliance with specified thickness requirements.

In Section 59-5.01 replace the 1st paragraph with:

Tubular sign structures shall be cleaned and painted in conformance with the provisions in Section 59-1, "General," and this Section 59-5. Sign structures, other than tubular sign structures, shall not be painted unless otherwise specified in the special provisions.

^^

SECTION 63: CAST-IN-PLACE CONCRETE PIPE
(Issued 10-21-11)

Replace Section 63 with:
SECTION 63: (BLANK)

^^

SECTION 64 PLASTIC PIPE
(Issued 06-05-09)

In Section 64-1.02 replace the 5th paragraph with:

HDPE compounds used in the manufacture of corrugated polyethylene pipe and fittings shall comply with AASHTO M 294 except that the mix shall contain not less than 2 nor greater than 4 percent well dispersed carbon black. HDPE compounds used in the manufacture of ribbed profile wall polyethylene pipe shall comply with ASTM F 894 except that Type E ultraviolet stabilizers shall not be allowed and carbon black shall be well dispersed in an amount not less than 2 percent nor greater than 4 percent.

Manufacturers of corrugated polyethylene pipe shall:

1. Participate in the National Transportation Product Evaluation Control Program (NTPEP) for each plant supplying corrugated polyethylene pipe and fittings for the project.
2. Conduct and maintain a quality control program under NTPEP.

3. Submit a copy to the Engineer of manufacturing plant audits and NTPEP test results from the current cycle of NTPEP testing for all pipe diameters supplied.

Type D corrugated polyethylene pipe is not allowed. Corrugated polyethylene pipe greater than 60 inches in nominal diameter is not allowed.

In Section 64-1.05 replace the 1st paragraph with:

Excavation, backfill, and shaped bedding shall comply with Section 19-3, "Structure Excavation and Backfill," except the following:

1. At locations where pipe is to be backfilled with concrete, the backfill shall comply with Section 64-1.06, "Concrete Backfill."
2. Corrugated polyethylene pipe that is greater than 48 inches in nominal diameter but not exceeding 60 inches in nominal diameter shall be backfilled with either controlled low strength material under the special provisions or slurry cement backfill under Section 19-3.062, "Slurry Cement Backfill."
3. Where cementitious or flowable backfill is used for structure backfill, the backfill shall be placed to a level not less than 12 inches above the crown of the pipe.

In Section 64-1.06 replace the 1st paragraph with:

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete conforming to the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 380 pounds of cementitious material per cubic yard. The concrete to be used will be designated in the contract item or shown on the plans.

In Section 64-1.06 replace the 3rd paragraph with:

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

^^

SECTION 65 REINFORCED CONCRETE PIPE
(Issued 07-20-12)

In Section 65-1.02 replace the 1st paragraph with:

Cementitious material and aggregate shall conform to the provisions in Section 90-2, "Materials" except that grading requirements shall not apply to the aggregate. Use of supplemental cementitious material shall conform to AASHTO Designation: M 170.

In Section 65-1.02A(1) in the 11th paragraph, replace item c with:

c. Cementitious material and aggregate for non-reinforced concrete pipe shall conform to the provisions in Section 65-1.02, "Materials."

In Section 65-1.035 replace the 1st paragraph with:

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete in conformance with the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 380 pounds of cementitious material per cubic yard. The concrete to be used will be designated in the contract item.

In Section 65-1.035 replace the 3rd paragraph with:

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

Replace Section 65-1.05 with:

65-1.05 (BLANK)

In Section 65-1.06 in the 2nd paragraph, replace the 1st subparagraph with:

Cement Mortar. - Mortar shall be composed of one part cementitious material and 2 parts sand by volume. Supplementary cementitious material will not be required.

In Section 65-1.10 in the 1st paragraph in the 1st sentence, delete "jacked reinforced concrete pipe."

In Section 65-1.10 delete the 2nd paragraph.

^^

SECTION 66 CORRUGATED METAL PIPE
(Issued 07-20-12)

In Section 66-1.045 replace the 1st paragraph with:

At locations where pipe is to be backfilled with concrete as shown on the plans, the concrete backfill shall be constructed of minor concrete or Class 4 concrete conforming to the provisions in Section 90, "Portland Cement Concrete." Minor concrete shall contain not less than 380 pounds of cementitious material per cubic yard. The concrete to be used will be designated in the contract item or shown on the plans.

In Section 66-1.045 replace the 3rd paragraph with:

The surface of the concrete backfill shall be broomed with a heavy broom to produce a uniform rough surface if hot mix asphalt is to be placed directly thereon.

Replace Section 66-3.10 with:

66-3.10 (BLANK)

In Section 66-4.02 delete the 2nd paragraph.

^^

SECTION 68 SUBSURFACE DRAINS
(Issued 07-31-07)

In Section 68-3.02D replace the 1st and 2nd paragraphs with:

Concrete for splash pads shall be produced from minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 470 pounds of cementitious material per cubic yard.

Mortar placed where edge drain outlets and vents connect to drainage pipe and existing drainage inlets shall conform to the provisions in Section 51-1.135, "Mortar."

In Section 68-3.03 replace the 13th paragraph with:

Cement treated permeable material, which is not covered with hot mix asphalt within 12 hours after compaction of the permeable material, shall be cured by either sprinkling the material with a fine spray of water every 4 hours during daylight hours or covering the material with a white polyethylene sheet, not less than 6 mils thick. The above curing requirements shall begin at 7:00 a.m. on the morning following compaction of the cement treated permeable material and continue for the next 72 hours or until the material is covered with hot mix asphalt, whichever is less. The cement treated permeable material shall not be sprayed with water during the first 12 hours after compacting, but may be covered with the polyethylene sheet during the first 12 hours or prior to the beginning of the cure period.

In Section 68-3.03 replace the 17th and 18th paragraphs with:

Hot mix asphalt for backfilling trenches in existing paved areas shall be produced from commercial quality aggregates and asphalt and mixed at a central mixing plant. The aggregate shall conform to the 3/4 inch grading, or the 1/2 inch grading for Type A and Type B hot mix asphalt specified in Section 39-1.02E, "Aggregate." The amount of asphalt binder to be mixed with the aggregate shall be between 4 percent and 7 percent by weight of the dry aggregate, as determined by the Engineer.

Hot mix asphalt backfill shall be spread and compacted in approximately 2 equal layers by methods that will produce a hot mix asphalt surfacing of uniform smoothness, texture and density. Each layer shall be compacted before the temperature of the mixture drops below 250 ºF. Prior to placing the hot mix asphalt backfill, a tack coat of asphaltic emulsion conforming to the provisions in Section 94, "Asphaltic Emulsions," shall be applied to the vertical edges of existing pavement at an approximate rate of 0.05 gallon per square yard.

In Section 68-3.03 replace the 20th paragraph with:

Type A pavement markers conforming to the details shown on the plans and the provisions in Section 85, "Pavement Markers," shall be placed on paved shoulders or dikes at outlet, vent and cleanout locations as directed by the Engineer. The waiting period for placing pavement markers on new hot mix asphalt surfacing will not apply.

Replace Section 68-3.05 with:

68-3.05 PAYMENT

The contract price paid per linear foot for plastic pipe (edge drain) of the size or sizes shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drains complete in place, including excavation (and removal of any concrete deposits that may occur along the lower edge of the concrete pavement in Type 1 installations) and hot mix asphalt backfill for Type 1 edge drain installation, tack coat, filter fabric, and treated permeable material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The contract price paid per linear foot for plastic pipe (edge drain outlet) of the size or sizes shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in installing edge drain outlets, vents and cleanouts complete in place, including outlet and vent covers, expansion plugs, pavement markers, concrete splash pads, connecting outlets and vents to drainage facilities, and excavation and backfill [aggregate base, hot mix asphalt, tack coat, and native material] for outlets, vents, and cleanouts to be installed in embankments and existing shoulders, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

^^

SECTION 69 OVERSIDE DRAINS

(Issued 07-31-07)

In Section 69-1.01 replace the 1st paragraph with:

This work shall consist of furnishing and installing entrance tapers, pipe downdrains, tapered inlets, flume downdrains, anchor assemblies, reducers, slip joints and hot mix asphalt overside drains to collect and carry surface

drainage down the roadway slopes as shown on the plans or as directed by the Engineer and as specified in these specifications and the special provisions.

Replace Section 69-1.02D with:

69-1.02D Hot Mix Asphalt

Hot mix asphalt for overside drains shall conform to the provisions in Section 39-1.13, "Miscellaneous Areas."

Replace Section 69-1.04 with:

69-1.04 HOT MIX ASPHALT OVERSIDE DRAINS

Hot mix asphalt overside drains shall be constructed as shown on the plans or as directed by the Engineer. The hot mix asphalt shall be placed in conformance with the provisions in Section 39-1.13, "Miscellaneous Areas."

In Section 69-1.06 replace the 2nd paragraph with:

Quantities of hot mix asphalt placed for overside drains will be paid for as provided in Section 39-5, "Measurement and Payment," for hot mix asphalt placed in miscellaneous areas.

^^

SECTION 70 MISCELLANEOUS FACILITIES
(Issued 01-20-12)

In Section 70-1.02C replace the 2nd paragraph with:

Precast concrete flared end sections shall conform to the requirements for Class III Reinforced Concrete Pipe in AASHTO Designation: M 170M. Cementitious materials and aggregate shall conform to the provisions in Section 90-2, "Materials," except that grading requirements shall not apply to the aggregate. Use of supplementary cementitious material shall conform to the requirements in AASHTO Designation: M 170. The area of steel reinforcement per linear foot of flared end section shall be at least equal to the minimum steel requirements for circular reinforcement in circular pipe for the internal diameter of the circular portion of the flared end section. The basis of acceptance of the precast concrete flared end section shall conform to the requirements of Section 5.1.2 of AASHTO Designation: M 170.

In Section 70-1.02C replace the 3rd paragraph with:

Plastic flared end sections shall conform to the requirements in ASTM Designation: D 3350.

In Section 70-1.02H replace the 1st paragraph with:

Precast concrete pipe risers and pipe reducers, and precast concrete pipe sections, adjustment rings and tapered sections for pipe energy dissipators, pipe inlets and pipe manholes shall conform to the requirements in AASHTO Designation: M 199M/M 199, except that the cementitious material and aggregate shall conform to the provisions in Section 90-2, "Materials," except that grading requirements shall not apply to the aggregate. Use of supplementary cementitious material shall conform to the requirements in AASHTO Designation: M 170.

In Section 70-1.03 replace the 2nd paragraph with:

Cutoff walls for precast concrete flared end sections shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 470 pounds of cementitious material per cubic yard.

^^

SECTION 72 SLOPE PROTECTION
(Issued 07-20-12)

In Section 72-4.04 replace the 6th paragraph with:

Pervious backfill material, if required by the plans, shall be placed as shown. A securely tied sack containing one cubic foot of pervious backfill material shall be placed at each weep hole and drain hole. The sack material shall conform to the requirements for filter fabric in Section 88-1.02, "Filtration."

Replace Section 72-5.05 with:

72-5.05 Measurement

Concreted-rock slope protection is measured by the ton or cubic yard.

Quantities of concreted-rock slope protection to be paid for by the cubic yard will be determined from the dimensions shown on the plans or the dimensions directed by the Engineer, and concreted-rock slope protection placed in excess of these dimensions will not be paid for.

Quantities of concreted-rock slope protection to be paid for by the ton will be determined from the weight of the rock in conformance with the provisions in Section 9-1.01, "Measurement of Quantities."

In Section 72-5.06 replace the 1st sentence with:

The contract price paid per cubic yard or per ton for concreted-rock slope protection designated in the Engineer's Estimate includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the concreted-rock slope protection, complete in place, including excavating and backfilling footing trenches and furnishing and placing concrete, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

^^

SECTION 73 CONCRETE CURBS AND SIDEWALKS
(Issued 06-05-09)

In Section 73-1.01 in the 2nd paragraph, replace item 2 with:

2. Minor concrete shall contain not less than 463 pounds of cementitious material per cubic yard except that when extruded or slip-formed curbs are constructed using 3/8-inch maximum size aggregate, minor concrete shall contain not less than 505 pounds of cementitious material per cubic yard.

In Section 73-1.06 replace the 15th paragraph with:

Where hot mix asphalt or portland cement concrete pavements are to be placed around or adjacent to manholes, pipe inlets or other miscellaneous structures in sidewalk, gutter depression, island paving, curb ramps or driveway areas, the structures shall not be constructed to final grade until after the pavements have been constructed for a reasonable distance on each side of the structures.

^^

SECTION 74 PUMPING PLANT EQUIPMENT
(Issued 07-01-08)

In Section 74-1.02 delete the 2nd paragraph.

^^

SECTION 75 MISCELLANEOUS METAL
(Issued 07-01-11)

In Section 75-1.02 replace the 6th paragraph with:

Manhole frames and covers shall conform to AASHTO M 306.

In Section 75-1.02 replace the 10th paragraph with:

Unless otherwise specified, materials shall conform to the following specifications:

Material	Specification
Steel bars, plates and shapes	ASTM Designation: A 36/A 36M or A 575, A 576 (AISI or M Grades 1016 through 1030)
Steel fastener components for general applications:	
Bolts and studs	ASTM Designation: A 307
Headed anchor bolts	ASTM Designation: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM Designation: F 1554 or A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO Designation: M 314 supplementary requirements, or AASHTO Designation: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: A 449, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Washers	ASTM Designation: F 844
Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM Designation: A 325, Type 1
Tension control bolts	ASTM Designation: F 1852, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Hardened washers	ASTM Designation: F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM Designation: F 959, Type 325, zinc-coated
Stainless steel fasteners (Alloys 304 & 316) for general applications:	
Bolts, screws, studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: F 593 or F 738M
Nuts	ASTM Designation: F 594 or F 836M
Washers	ASTM Designation: A 240/A 240M and ANSI B 18.22M
Carbon-steel castings	ASTM Designation: A 27/A 27M, Grade 65-35, Class 1
Malleable iron castings	ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings Inside a roadbed Outside a roadbed	 AASHTO M 306 AASHTO M306 except only AASHTO M105, Class 35B is allowed
Ductile iron castings	ASTM Designation: A 536, Grade 65-45-12
Cast iron pipe	Commercial quality
Steel pipe	Commercial quality, welded or extruded
Other parts for general applications	Commercial quality

*Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dyed dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

In Section 75-1.03 replace the 13th paragraph with:

Concrete anchorage devices shall be mechanical expansion or resin capsule types installed in drilled holes or cast-in-place insert types. The anchorage devices shall be selected from the Department's Pre-Qualified Products List. The qualification requirements for concrete anchorage devices may be obtained from the Pre-Qualified Products List Web site.

The anchorage devices shall be a complete system, including threaded studs, hex nuts, and cut washers. Thread dimensions for externally threaded concrete anchorage devices prior to zinc coating shall conform to the requirements in ASME Standard: B1.1 having Class 2A tolerances or ASME Standard: B1.13M having Grade 6g tolerances. Thread dimensions for internally threaded concrete anchorage devices shall conform to the requirements in ASTM A 563.

In Section 75-1.03 replace the 18th paragraph with:

Mechanical expansion anchors shall, when installed in accordance with the manufacturer's instructions and these specifications and tested in conformance with the requirements in California Test 681, withstand the application of a sustained tension test load of at least the following values for at least 48 hours with a movement not greater than 0.035 inch:

Stud Diameter (inches)	Sustained Tension Test Load (pounds)
*3/4	5,000
5/8	4,100
1/2	3,200
3/8	2,100
1/4	1,000

* Maximum stud diameter permitted for mechanical expansion anchors.

Resin capsule anchors shall, when installed in accordance with the manufacturer's instructions and these specifications and tested in conformance with the requirements in California Test 681, withstand the application of a sustained tension test load of at least the following values for at least 48 hours with a movement not greater than 0.010 inch:

Stud Diameter (inches)	Sustained Tension Test Load (pounds)
1-1/4	31,000
1	17,900
7/8	14,400
3/4	5,000
5/8	4,100
1/2	3,200
3/8	2,100
1/4	1,000

At least 25 days before use, the Contractor shall submit one sample of each resin capsule anchor per lot to the Transportation Laboratory for testing. A lot of resin capsule anchors is 100 units, or fraction thereof, of the same brand and product name.

In Section 75-1.03 replace the 20th paragraph with:

A Certificate of Compliance for concrete anchorage devices shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."

In Section 75-1.03 replace the 24th paragraph with:

Sealing compound, for caulking and adhesive sealing, shall be a polysulfide or polyurethane material conforming to the requirements in ASTM Designation: C 920, Type S, Grade NS, Class 25, Use O.

In Section 75-1.035 in the 3rd paragraph, replace the 1st sentence with:

Cables shall be 3/4 inch preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 23 tons.

In Section 75-1.035 in the 4th paragraph, replace item C with:

C. Nuts shall conform to the requirements in ASTM Designation: A 563 including Appendix X1, except lubrication is not required.

In Section 75-1.035 replace the 12th paragraph with:

Concrete for filling cable drum units shall conform to the provisions in Section 90-10, "Minor Concrete," or at the option of the Contractor, may be a mix with 3/8-inch maximum size aggregate and not less than 675 pounds of cementitious material per cubic yard.

In Section 75-1.05 replace the 6th paragraph with:

Galvanizing of iron and steel hardware and nuts and bolts, when specified or shown on the plans, shall conform to the requirements in ASTM Designation: A 153/A 153M, except whenever threaded studs, bolts, nuts, and washers are specified to conform to the requirements in ASTM Designation: A 307, A 325, A 449, A 563, F 436, or F 1554 and zinc coating is required, they shall be hot-dip zinc coated or mechanically zinc coated in conformance with the requirements in the ASTM Designations. Unless otherwise specified, galvanizing shall be performed after fabrication.

In Section 75-1.05 replace the 8th paragraph with:

Tapping of nuts or other internally threaded parts to be used with zinc coated bolts, anchor bars or studs shall be done after galvanizing and shall conform to the requirements for thread dimensions and overtapping allowances in ASTM Designation: A 563.

^^

SECTION 80 FENCES

(Issued 01-05-07)

In Section 80-3.01F replace the 4th paragraph with:

Portland cement concrete for metal post and brace footings and for deadmen shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 470 pounds of cementitious material per cubic yard.

In Section 80-4.01C replace the 4th paragraph with:

Portland cement concrete for metal post and for deadmen shall be produced from minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 470 pounds of cementitious material per cubic yard.

^^

SECTION 83 RAILINGS AND BARRIERS
(Issued 07-01-11)

In Section 83-1.02 replace the 7th paragraph with:

Mortar shall conform to the provisions in Section 51-1.135, "Mortar," and shall consist of one part by volume of cementitious material and 3 parts of clean sand.

In Section 83-1.02B in the 24th paragraph in the 8th subparagraph, replace the 1st sentence with:

Anchor cable shall be 3/4 inch preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 23 tons.

In Section 83-1.02E in the 6th paragraph, replace the 2nd sentence with:

Cable shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

In Section 83-1.02I replace the 5th paragraph with:

Where shown on the plans, cables used in the frame shall be 5/16 inch in diameter, wire rope, with a minimum breaking strength of 5,000 pounds and shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

In Section 83-1.02I replace the 14th paragraph with:

Chain link fabric shall be 11-gage conforming to one of the following:

1. AASHTO Designation: M181, Type I, Class C
2. AASHTO Designation: M181, Type IV, Class A
3. ASTM F 1345, Class 2

In Section 83-2.02D(1) replace the 5th paragraph with:

When concrete barriers are to be constructed on existing structures, the dowels shall be bonded in holes drilled in the existing concrete. Drilling of holes and bonding of dowels shall conform to the following:

1. The bonding materials shall be either magnesium phosphate concrete, modified high alumina based concrete or portland cement based concrete. Magnesium phosphate concrete shall be either single component (water activated) or dual component (with a prepackaged liquid activator). Modified high alumina based concrete and portland cement based concrete shall be water activated. Bonding materials shall conform to the following requirements:

Property	Test Method	Requirements
Compressive Strength		
at 3 hours, MPa	California Test 551	21 min.
at 24 hours, MPa	California Test 551	35 min.
Flexure Strength		
at 24 hours, MPa	California Test 551	3.5 min.
Bond Strength: at 24 hours		
SSD Concrete, MPa	California Test 551	2.1 min.
Dry Concrete, MPa	California Test 551	2.8 min.
Water Absorption, %	California Test 551	10 max.
Abrasion Resistance		
at 24 hours, grams	California Test 550	25 max.
Drying Shrinkage at 4 days, %	ASTM Designation: C 596	0.13 max.
Soluble Chlorides by weight, %	California Test 422	0.05 max.
Water Soluble Sulfates by weight, %	California Test 417	0.25 max.

2. Magnesium phosphate concrete shall be formulated for minimum initial set time of 15 minutes and minimum final set time of 25 minutes at 70° F. The materials, prior to use, shall be stored in a cool, dry environment.
3. Mix water used with water activated material shall conform to the provisions in Section 90-2.03, "Water."
4. The quantity of water for single component type or liquid activator (for dual component type) to be blended with the dry component, shall be within the limits recommended by the manufacturer and shall be the least amount required to produce a pourable batter.
5. Addition of retarders, when required and approved by the Engineer, shall be in conformance with the manufacturer's recommendations.
6. Before using concrete material that has not been previously approved, a minimum of 45 pounds shall be submitted to the Engineer for testing. The Contractor shall allow 45 days for the testing. Each shipment of concrete material that has been previously approved shall be accompanied by a Certificate of Compliance as provided in Section 6-1.07, "Certificates of Compliance."
7. Magnesium phosphate concrete shall not be mixed in containers or worked with tools containing zinc, cadmium, aluminum or copper metals. Modified high alumina based concrete shall not be mixed in containers or worked with tools containing aluminum.
8. The surface of any dowel coated with zinc or cadmium shall be coated with a colored lacquer before installation of the dowel. The lacquer shall be allowed to dry thoroughly before embedment of the dowels.
9. The holes shall be drilled by methods that will not shatter or damage the concrete adjacent to the hole. The diameter of the drilled hole shall be $^1/_2$ inch larger than the nominal diameter of the dowels.
10. The drilled holes shall be clean and dry at the time of placing the bonding material and the steel dowels. Bonding material and dowel shall completely fill the drilled hole. The surface temperature shall be 40° F or above when the bonding material is placed.
11. After bonding, dowels shall remain undisturbed for a minimum of 3 hours or until the bonding material has reached a strength sufficient to support the dowels. Dowels that are improperly bonded, as determined by the Engineer, shall be removed. The holes shall be cleaned or new holes shall be drilled and the dowels replaced and securely bonded to the concrete. Removing, redrilling and replacing improperly bonded dowels shall be performed at the Contractor's expense. Modified high alumina based concrete and portland cement based concrete shall be cured in conformance with the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications. Magnesium phosphate concrete shall not be cured.

In Section 83-2.02D(1) replace the 8th paragraph with:

Granular material for backfill between the 2 walls of concrete barrier (Types 50E, 60F, 60GE and 60SF), as shown on the plans, shall be placed without compaction.

In Section 83-2.02D(2) in the 1st paragraph, replace item b with:

b. If the 3/8-inch maximum size aggregate grading is used to construct extruded or slip-formed concrete barriers, the cementitious material content of the minor concrete shall be not less than 675 pounds per cubic yard.

In Section 83-2.02D(2) replace the 3rd paragraph with:

The concrete paving between the tops of the 2 walls of concrete barrier (Types 50E, 60F, 60GE, and 60SF) and the optional concrete slab at the base between the 2 walls of concrete barrier (Types 50E, 60F, 60GE, and 60SF) shall be constructed of minor concrete conforming to the provisions of Section 90-10, "Minor Concrete," except that the minor concrete shall contain not less than 505 pounds of cementitious material per cubic yard.

In Section 83-2.02D(2) replace the 8th paragraph with:

Granular material for backfill between the 2 walls of concrete barrier (Types 50E, 60F, 60GE and 60SF) shall be earthy material suitable for the purpose intended, having no rocks, lumps or clods exceeding1-1/2 inches in greatest dimension.

In Section 83-2.03 replace the 8th and 9th paragraphs with:

Concrete barriers, except Type 50E, Type 60F, Type 60GE, and Type 60SF will be measured along the top of the barrier.

Concrete barriers Type 50E, Type 60F, Type 60GE, and Type 60SF will be measured once along the centerline between the 2 walls of the barrier.

In Section 83-2.04 replace the 3rd paragraph with:

The contract prices paid per linear foot for concrete barrier of the type or types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing the concrete barriers, complete in place, including bar reinforcing steel, steel dowels and drilling and bonding dowels in structures, hardware for steel plate barrier, miscellaneous metal, excavation, backfill (including concrete paving for, and granular material or concrete slab used as backfill in Type 50E, Type 60F, Type 60GE, and Type 60SF concrete barrier), and disposing of surplus material and for furnishing, placing, removing and disposing of the temporary railing for closing the gap between existing barrier and the concrete barrier being constructed, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

^^

SECTION 85 PAVEMENT MARKERS
(Issued 07-31-07)

In Section 85-1.06 replace the 6th paragraph with:

Pavement markers shall not be placed on new hot mix asphalt surfacing or seal coat until the surfacing or seal coat has been opened to public traffic for a period of not less than 7 days when hot melt bituminous adhesive is used, and not less than 14 days when epoxy adhesive is used.

In Section 85-1.06 in the 14th paragraph, replace the 2nd sentence with:

Cleaning shall be done by blast cleaning on all surfaces regardless of age or type, except that blast cleaning of clean, new hot mix asphalt and clean, new seal coat surfaces will not be required when hot melt bituminous adhesive is used.

^^

SECTION 86 SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
(Issued 01-20-12)

Replace Section 86 with:

SECTION 86 ELECTRICAL SYSTEMS

86-1 GENERAL

86-1.01 DESCRIPTION

Section 86 includes specifications for installing, modifying, and removing:

1. Traffic signal
2. Interconnect system
3. Ramp metering system
4. Flashing beacon system
5. Lighting system
6. Sign illumination system
7. Traffic monitoring station
8. Communication system
9. Electrical equipment in structure
10. Falsework lighting

Comply with Part 4 of the California MUTCD. Nothing in this Section 86 is to be construed as to reduce the minimum standards in this manual.

The locations of electrical system elements are approximate; the Engineer will approve final location.

86-1.015 DEFINITIONS

Definitions pertain only to Section 86, "Electrical Systems."

actuation: As defined in the California MUTCD.

channel: Discrete information path.

controller assembly: Controller unit and auxiliary equipment housed in a rainproof cabinet to control a system's operations.

controller unit: Part of the controller assembly performing the basic timing and logic functions.

detector: As defined in the California MUTCD.

electrolier: Complete assembly of lighting standard and luminaire.

flasher: Device to open and close signal circuits at a repetitive rate.

flashing beacon control assembly: Switches, circuit breakers, terminal blocks, flasher, wiring, and necessary electrical components all housed in a single enclosure to properly operate a beacon.

inductive loop detector: Detector capable of being actuated by inductance change caused by vehicle passing or standing over the loop.

lighting standard: Pole and mast arm supporting the luminaire.

luminaire: Assembly that houses the light source and controls the light emitted from the light source.

magnetic detector: Detector capable of being actuated by induced voltage caused by vehicle passing through the earth's magnetic field.

powder coating: A coating applied electrostatically using UV-stable polymer exterior grade powder.

pre-timed controller assembly: Operates traffic signals under a predetermined cycle length.

signal face: As defined in the California MUTCD.

signal head: As defined in the California MUTCD.

signal indication: As defined in the California MUTCD.

signal section: As defined in the California MUTCD.

signal standard: Pole and mast arm supporting one or more signal faces with or without a luminaire mast arm.

traffic-actuated controller assembly: Operates traffic signals under the varying demands of traffic as registered by detector actuation.

traffic phase: Signal phase as defined in the California MUTCD.

vehicle: As defined in the California Vehicle Code.

86-1.02 REGULATIONS AND CODE Electrical equipment must comply with one or more of the following:

1. ANSI
2. ASTM
3. 8 CA Code of Regs § 2299 et seq.
4. EIA
5. NEMA

6. NETA
7. UL

Materials and workmanship must comply with:

1. FCC
2. ITE
3. NEC
4. NRTL
5. Public Utilities Commission, General Order No. 95, "Rules for Overhead Electrical Line Construction"
6. Public Utilities Commission, General Order No. 128, "Rules for Construction of Underground Electric Supply and Communication Systems"

86-1.03 COST BREAK-DOWN

Determine quantities required to complete work. Submit the quantities as part of the cost breakdown.

The sum of the amounts for the units of work listed in the cost breakdown must equal the contract lump sum price bid for the work. Include overhead and profit for each unit of work listed in the cost breakdown. If mobilization is a bid item, include bond premium, temporary construction facilities, and material plants into the mobilization bid item, otherwise, include in each unit of work listed in the cost breakdown. Do not include costs for traffic control system in the cost breakdown.

The cost breakdown may be used to determine partial payment and to calculate payment adjustments for additional costs incurred due to a change order. If a change order increases or decreases the quantities, payment adjustment may be determined under Section 4-1.03B, "Increased or Decreased Quantities."

The cost breakdown must include type, size, and installation method for:

1. Foundations
2. Standards and poles
3. Conduit
4. Pull boxes
5. Conductors and cables
6. Service equipment enclosures
7. Telephone demarcation cabinet
8. Signal heads and hardware
9. Pedestrian signal heads and hardware
10. Pedestrian push buttons
11. Loop detectors
12. Luminaires and lighting fixtures

86-1.04 EQUIPMENT LIST AND DRAWINGS

Within 15 days of contract approval, submit for review a list of equipment and materials that you propose to install. Comply with Section 5-1.02, "Plans and Working Drawings." The list must include:

1. Name of manufacturer
2. Dimension
3. Item identification number
4. List of components

The list must be supplemented by other data as required, including:

1. Schematic wiring diagrams
2. Scale drawings of cabinets showing location and spacing of shelves, terminal blocks, and equipment, including dimensioning
3. Operation manual

Submit 2 copies of the above data. The Engineer will review within 15 days.

Electrical equipment that is manufactured as detailed on the plans will not require detailed drawings and diagrams.

Furnish 3 sets of computer-generated cabinet schematic wiring diagrams.

The cabinet schematic wiring diagram must be placed in a heavy duty plastic envelope and attached to the inside of the door of each cabinet.

Prepare diagrams, plans, and drawings using graphic symbols in IEEE 315, "Graphic Symbols for Electrical and Electronic Diagrams."

86-1.05 CERTIFICATE OF COMPLIANCE

Submit a Certificate of Compliance for all electrical material and equipment to the Engineer under Section 6-1.07, "Certificates of Compliance."

86-1.06 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

Keep existing electrical system or approved temporary replacement in working order during the progress of the work. Shutdown is allowed for alteration or removal of the system. Traffic signal shutdown must be limited to normal working hours. Lighting system shutdown must not interfere with the regular lighting schedule.

Notify the Engineer before performing work on the existing system.

Notify the local traffic enforcement agency before traffic signal shutdown.

If existing or temporary system must be modified, work not shown on the plans or specified in the special provisions, but required to keep the system in working order will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

The State or local agency will:

1. Continue the operation and maintenance of existing electrical facilities
2. Continue to provide electrical energy to operate existing electrical facilities
3. Repair or replace existing facilities damaged by public traffic
4. Pay for electrical energy to operate existing or new facilities undergoing the functional tests described in Section 86-2.14C, "Functional Testing"

Verify location and depth of existing detectors, conduits, pull boxes, and other electrical facilities before using tools or equipment that may damage those facilities or interfere with an electrical system.

Notify the Engineer immediately if existing facility is damaged by your activities. Repair or replace damaged facility promptly. If you fail to complete the repair or replacement, promptly, the State will repair or replace and deduct the costs.

Damaged detectors must be replaced within 24 hours at your expense. If you fail to complete the repair within 24 hours, the State will repair and deduct the repair costs.

If roadway remains open to traffic while an existing lighting system is modified:

1. Keep existing system in working order
2. Make final connection so the modified circuit is in operation by nightfall

Keep temporary electrical installations in working order until no longer required. Remove temporary installations as specified in Section 86-7, "Removing, Reinstalling or Salvaging Electrical Equipment."

These provisions do not void your responsibilities as specified in Section 7-1.12, "Indemnification and Insurance," and Section 7-1.16, "Contractor's Responsibility for the Work and Materials."

During traffic signal system shutdown, place W3-1a, "STOP AHEAD," and R1-1, "STOP," signs in each direction to direct traffic through the intersection. For 2-lane approaches, place 2 R1-1 signs.

W3-1a and R1-1 signs must comply with Section 12-3.06, "Construction Area Signs." Use a minimum size of 30 inches for the R1-1 sign.

Cover signal faces when the system is shut down overnight. Cover temporary W3-1a and R1-1 signs when the system is turned on.

86-1.07 SCHEDULING OF WORK

Except service installation and service equipment enclosure, do not work above ground until all materials are on hand to complete electrical work at each location. Schedule work to allow each system to be completed and ready for operation before opening the corresponding section of the roadway to traffic.

If street lighting exists or is installed in conjunction with traffic signals, do not turn on the signals until the street lighting is energized.

Traffic signals will not be placed in operation until the roadways to be controlled are open to public traffic.

Lighting and traffic signals, including flashing operation, will not be placed in operation before starting the functional test period specified in Section 86-2.14, "Testing."

Do not pull conductors into conduit until:

1. Pull boxes are set to grade
2. Metallic conduit is bonded

In vehicular undercrossings, soffit lights must be in operation as soon as practicable after falsework has been removed from the structure. Lighting for pedestrian structures must be in operation before opening the structure to pedestrian traffic.

If the Engineer orders soffit lights or lighting for pedestrian structures to be activated before permanent power service is available, the cost of installing and removing temporary power service will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

The initial traffic signal turn-on must be made between 9:00 a.m. and 2:00 p.m. Before the initial turn-on, all equipment, including pedestrian signals, pedestrian push buttons, vehicle detectors, lighting, signs, and pavement delineation must be installed and in working order. Direct louvers, visors, and signal faces to maximize visibility.

Start functional tests on any working day except Friday or the day before a legal holiday. You must notify the Engineer 48 hours before the start of functional test.

86-1.08 (BLANK)

86-2 MATERIALS AND INSTALLATION

86-2.01 EXCAVATING AND BACKFILLING

Dispose of surplus excavated material under Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way."

Backfill as specified in Section 19-3, "Structure Excavation and Backfill." Compact backfill in conduit trenches outside the hinge point of slopes and not under pavement to a minimum relative compaction of 90 percent. Compact backfill within hinge points and in areas where pavement is to be constructed to a minimum relative compaction of 95 percent.

Backfill trenches and restore sidewalk, pavement, and landscaping at one intersection before starting excavation at another intersection.

If excavating on a street or highway, restrict closure to 1 lane at a time.

86-2.02 REMOVING AND REPLACING IMPROVEMENTS

Replace or reconstruct sidewalk, curb, gutter, concrete pavement, asphalt concrete pavement, underlying material, lawn, plant, and other facilities damaged by your activities. Replacement material must be of equal or better quality than the material replaced. Work must be in a serviceable condition.

If a part of a square or slab of concrete sidewalk, curb, gutter, or driveway is broken or damaged, the entire square or slab must be removed and reconstructed.

Cut outline of PCC sidewalk or driveway to be removed:

1. Using a power-driven saw
2. On a neat line
3. To a 0.17-foot minimum depth

86-2.03 FOUNDATIONS

Except for concrete for cast-in-drilled-hole concrete pile foundation, PCC must comply with Section 90-10, "Minor Concrete."

Construct concrete foundation on firm ground.

After each post, standard, and pedestal is properly positioned, place mortar under the base plate. Finish exposed portion to present a neat appearance. Mortar must comply with Section 51-1.135, "Mortar," except mortar must have:

1. 1 part by volume of cementitious material
2. 3 parts by volume of clean sand

Reinforced cast-in-drilled-hole concrete pile foundation must comply with Section 49, "Piling," except:

1. Material resulting from drilling holes must be disposed of as specified in Section 86-2.01, "Excavating and Backfilling"

2. Concrete for cast-in-drilled-hole concrete pile will not be considered as designated by compressive strength

Form exposed portion of the foundation to present a neat appearance and true to line and grade. The top of a foundation for post and standard must be finished to curb or sidewalk grade. Forms must be rigid and securely braced in place. Conduit ends and anchor bolts must be placed at proper height and position. Anchor bolts must be installed a maximum of 1:40 from vertical and held in place by rigid top and bottom templates. Use a steel bottom template at least 1/2 inch thick that provides proper spacing and alignment of anchor bolts near the embedded bottom end. Install bottom template before placing footing concrete.

Provide new foundation and anchor bolts of the proper type and size for relocated standards.

Steel parts must be galvanized as specified in Section 75-1.05, "Galvanizing."

Provide 2 nuts and washers for the upper threaded part of each anchor bolt. Provide 3 nuts and washers for each anchor bar or stud.

Do not weld high-strength steel used for anchor bolt, anchor bar, or stud.

Before placing concrete, moisten forms and ground. Keep forms in place until the concrete sets for at least 24 hours and is strong enough to prevent damage to surface.

Except if located on a structure, construct foundation for post, standard, and pedestal monolithically.

Apply ordinary surface finish as specified in Section 51-1.18A, "Ordinary Surface Finish."

If a foundation must be extended for additional depth, the extension work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

Do not erect post, pole, standard, pedestal, or cabinet until the foundation is set for a minimum of 7 days.

The Engineer will choose the plumbing or raking technique for posts, standards, and pedestals. Plumb or rake by adjusting the leveling nuts before tightening nuts. Do not use shims or similar devices. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made, and each post, standard, and pedestal on structure is properly positioned, tighten nuts as follows:

1. Tighten leveling nuts and top nuts, following a crisscross pattern, until bearing surfaces of all nuts, washers, and base plates are in firm contact.
2. Use an indelible marker to mark the top nuts and base plate with lines showing relative alignment of the nut to the base plate.
3. Tighten top nuts, following a crisscross pattern, an additional 1/6th of a turn.

In unpaved areas, construct a raised PCC pad in front of each controller cabinet.

Completely remove foundations not to be reused or abandoned.

If abandoning a foundation, remove the top of foundation, anchor bolts, and conduits to a minimum depth of 0.5 foot below sidewalk surface or original ground. Backfill the resulting hole with material equivalent to the surrounding material.

86-2.04 STANDARDS, STEEL PEDESTALS AND POSTS

Bolts, including anchor bolts, nuts, and washers for signal and lighting support structures must comply with Section 55-2, "Materials." Except for bearing-type connection or slip-base, high-strength bolted connection must comply with Section 55-3.14, "Bolted Connections." Welding, nondestructive testing of welds, and acceptance and repair criteria for steel member nondestructive testing must comply with American Welding Society (AWS) D1.1.

Using stainless steel rivets, attach rectangular corrosion-resistant metal identification tag on all standards and poles, except Type 1:

1. Above the hand hole, near the base of standards and poles
2. On the underside of mast arms near the arm plate

The lettering on each identification tag must be depressed or raised, 1/4 inch tall, legible, and include the following information:

1. Name of the manufacturer
2. Date of manufacture
3. Identification number
4. Contract number
5. Unique identification code that is:

    5.1. Assigned by the manufacturer
    5.2. Traceable to a particular contract and the welds on that component

5.3. Readable after the support structure is coated and installed

Type 1 standard and steel pedestal for controller cabinet must be manufactured of one of the following:

1. 0.12-inch or thicker galvanized steel
2. 4-inch standard weight galvanized steel pipe as specified in ASTM A 53
3. 4-inch Type 1 conduit with the top designed for post-top slip-fitter

Ferrous metal parts of a standard that has a shaft length of 15 feet or longer must comply with the provisions in Section 55-2, "Materials," and the following:

1. Standard must be manufactured from sheet steel of weldable grade having a minimum yield strength of 40,000 psi after manufacturing.
2. Certified test report verifying compliance with minimum yield strength requirements must be submitted. Test report may be the mill test report for the as-received steel or if the as-received steel has a lower yield strength than required you must provide test data assuring that your method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. Test data must include tensile properties of the steel after cold forming for specific heats and thicknesses.
3. If a single-ply 5/16-inch thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.
4. Standard may be manufactured of full-length sheets or shorter sections. Each section must be manufactured from 1 or 2 pieces of sheet steel. If 2 pieces are used, the longitudinal welded seams must be directly opposite from one another. If the sections are butt-welded together, the longitudinal welded seams of adjacent sections must be placed to form continuous straight seams from base to top of standard.
5. Butt-welded circumferential joints of tubular sections requiring CJP groove welds must be made using a metal sleeve backing ring inside each joint. The sleeve must be 1/8 inch nominal thickness, or thicker, and manufactured from steel having the same chemical composition as the steel in the tubular sections to be joined. If the sections to be joined have different specified minimum yield strengths, the steel in the sleeve must have the same chemical composition as the tubular section having the higher minimum yield strength. The width of the metal sleeve must be consistent with the type of nondestructive testing selected and must be a minimum width of 1 inch. At fitting time, the sleeve must be centered at the joint and in contact with the tubular section at the point of the weld.
6. Welds must be continuous.
7. Weld metal at the transverse joint must extend to the sleeve, making the sleeve an integral part of the joint.
8. During manufacturing, longitudinal seams on vertical tubular members of cantilevered support structures must be centered on and along the side of the pole that the pole plate is located. Longitudinal seams on horizontal tubular members, including signal and luminaire arms, must be within ±45 degrees of the bottom of the arm.
9. Longitudinal seam weld in steel tubular section may be made by the electric resistance welding process.
10. Longitudinal seam weld must have 60 percent minimum penetration, except:

    10.1. Within 6 inches of circumferential weld, longitudinal seam weld must be CJP groove weld.
    10.2. Longitudinal seam weld on lighting support structure having telescopic pole segment splice must be CJP groove weld on the female end for a length on each end equal to the designated slip-fit splice length plus 6 inches.

11. Exposed circumferential weld, except fillet and fatigue-resistant weld, must be ground flush with the base metal before galvanizing or painting. Ground flush is specified as -0, +0.08-inch.
12. Circumferential weld and base plate-to-pole weld may be repaired only one time.
13. Exposed edges of the plates that make up the base assembly must be finished smooth and exposed corners of the plates must be broken. Provide shafts with slip-fitter shaft caps.
14. Surface flatness requirements of ASTM A 6 apply to plates:

    14.1. In contact with concrete, grout, or washers and leveling nuts
    14.2. In high-strength bolted connections
    14.3. In joints, where cap screws are used to secure luminaire and signal arms
    14.4. Used for breakaway slip-base assemblies

15. Standard must be straight with a maximum variation of:

15.1. 1 inch measured at the midpoint of a 30-foot to 35-foot standard
15.2. 3/4 inch measured at the midpoint of a 17-foot to 20-foot standard
15.3. 1 inch measured 15 feet above the base plate for Type 35 and Type 36 standards

16. Zinc-coated nuts used on fastener assemblies having a specified preload obtained by specifying a prescribed tension, torque value, or degree of turn must be provided with a colored lubricant, clean and dry to the touch. The lubricant color must contrast the zinc coating color on the nut so the presence of the lubricant is visually obvious. Lubricant must be insoluble in water or the fastener components must be shipped to the job site in a sealed container.
17. Do not make additional holes in structural members.
18. Standard with an outside diameter of 12 inches or less must be round. Standard with an outside diameter greater than 12 inches must be round or multisided. Multisided standard must be convex with a minimum of 12 sides and have a minimum bend radius of 4 inches.
19. Manufacture mast arm from material specified for standard.
20. Manufacture cast steel option for slip base from material of Grade 70-40, as specified in ASTM A 27/A 27M. Other comparable material may be used if approved by the Engineer. The casting tolerances must comply with the Steel Founders' Society of America's recommendations for green sand molding.
21. One casting from each lot of a maximum of 50 castings must be radiographed as specified in ASTM E 94. Casting must comply with the acceptance criteria for severity level 3 or better for the types and categories of discontinuities in ASTM E 186 and E 446. If the casting fails the inspection, 2 additional castings must be radiographed. If the 2 additional castings fail the inspection, the entire lot will be rejected.
22. Material certification, consisting of physical and chemical properties, and radiographic film of the casting must be filed at the manufacturer's office. Certification and film must be available for inspection.
23. High-strength bolts, nuts, and flat washers used to connect slip-base plate must comply with ASTM A 325 or A 325M and be galvanized as specified in Section 75-1.05, "Galvanizing."
24. Plate washers must be manufactured by saw cutting and drilling steel plate. Steel plate must comply with AISI 1018 and be galvanized as specified in Section 75-1.05, "Galvanizing." Before galvanizing, remove burrs and sharp edges and chamfer both sides of holes to allow the bolt head to make full contact with the washer without tension.
25. High-strength cap screws for attaching arms to standards must comply with ASTM A 325, A 325M, or A 449, and the mechanical requirements in ASTM A 325 or A 325M after galvanizing. Cap screws must be galvanized as specified in Section 75-1.05, "Galvanizing." Coat threads of cap screws with a colored lubricant, clean and dry to the touch. Lubricant color must contrast the zinc-coating color on the cap screw so the presence of the lubricant is visually obvious. Lubricant must be insoluble in water or the fastener components must be shipped to the job site in a sealed container.
26. Bolted connection attaching signal or luminaire arm to pole must be considered slip critical. Galvanized faying surfaces of plates on luminaire, signal arm, and pole must be roughened by hand using a wire brush before assembly and must comply with requirements for Class C surface conditions for slip-critical connections in "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," a specification approved by the Research Council on Structural Connections (RCSC). Paint for faying surfaces must be as specified in the RCSC specification for Class B coating.
27. The Engineer will randomly take samples of fastener components from each production lot and submit to the Transportation Laboratory with test reports as specified in ASTM fastener specifications for QA testing and evaluation. The Engineer will determine sample sizes for each fastener component.

Change in mast arm configuration is allowed as long as the mounting height and stability are maintained.

Before manufacturing, details must be adjusted to ensure that cap screw heads can be turned using conventional installation tools. During manufacturing process, to avoid interference with the cap screw heads, the position of the luminaire arm on the arm plate must be properly located.

Configure mast arm as a smooth curving arm.

Push button post, pedestrian barricade, and guard post must comply with ASTM A 53.

Assemble and tighten slip base when pole is on the ground. Threads of heavy hex nuts for each slip-base bolt must be coated with additional lubricant that is clean and dry to the touch. Tighten high strength slip-base bolts to within ±10 foot-pounds of the following:

Slip-Base Bolt-Tightening Requirements

Standard Type	Torque (foot-pounds)
15-SB	150
30	150
31	200
36-20A	165

Hole in shaft of existing standard, due to removal of equipment or mast arms, must be sealed by fastening a galvanized steel disk to cover the hole. Fasten using a single central galvanized steel fastener. Seal edges of disk and hole with polysulfide or polyurethane sealing compound of Type S, Grade NS, Class 25, and Use O, as specified in ASTM C 920.

If existing standard is ordered to be relocated or reused, remove large dents, straighten shafts, and replace parts that are in poor condition. You must furnish anchor bolts or bars and nuts required for relocating or reusing standard. Repair and replacement work will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

New nuts, bolts, cap screws, and washers must be provided if:

1. Standard or mast arm is relocated
2. Used standard or mast arm is State furnished

If the standard has a slip base, a new keeper plate must be provided.

86-2.05 CONDUIT

Run conductors in conduit except for overhead and where conductors are run inside poles.

You may use a larger size conduit than specified as long as you use it for the entire length between outlets. Do not use reducing coupling.

New conduit must not pass through existing foundations for standards.

86-2.05A Material

Conduit and conduit fitting must be UL or NRTL listed and comply with the following:

Conduit and Conduit Fitting Requirements

Type 1	Hot-dip galvanized rigid steel conduit and conduit couplings must comply with UL 6 and ANSI C80.1. Zinc coating testing must comply with copper sulfate test requirements in UL 6. Conduit couplings for rigid steel conduit must be electrogalvanized.
Type 2	Hot-dip galvanized rigid steel conduit must comply with requirements for Type 1conduit and be coated with polyvinyl chloride (PVC) or polyethylene. Exterior thermoplastic coating must have a minimum thickness of 35 mils. Internal coating must have a minimum thickness of 2 mils. Coated conduit must comply with UL 6; NEMA RN 1; or NRTL PVC-001.
Type 3	Rigid nonmetallic PVC conduit must comply with UL 651. Type A extruded rigid PVC conduit and extruded rigid HDPE conduit must comply with UL 651A. Coilable, smooth-wall, continuous length HDPE conduits must comply with UL 651B. Install at underground locations only.
Type 4	Waterproof flexible metal conduit must consist of conduit with a waterproof non-metallic sunlight-resistant jacket over an inner flexible metal core. Type4 conduit must be UL listed for use as the grounding conductor.
Type 5	Intermediate steel conduit and conduit couplings must comply with UL 1242 and ANSI C80.6. Zinc coating testing must comply with copper sulfate test requirements in UL 1242. Conduit couplings for intermediate rigid steel conduit must be electrogalvanized. Type 5 conduit must only be used if specified.

Bonding bushings to be installed on metal conduit must be insulated and either galvanized or zinc alloy type.

Fittings for steel conduit and for watertight flexible metal conduit must be UL listed at UL 514B.

86-2.05B Use

Install Type 1 conduit on all exposed surfaces and at the following locations:

1. In concrete structures
2. Between a structure and nearest pull box

Exposed conduit installed on painted structure must be painted the same color as the structure.

Change or extend existing conduit runs using the same material. Install pull box if an underground conduit changes from the metallic type to Type 3.

Minimum trade size of conduit must be:

1. 1-1/2 inches from electrolier to adjacent pull box
2. 1 inch from pedestrian push button post to adjacent pull box
3. 2 inches from signal standard to adjacent pull box
4. 3 inches from controller cabinet to adjacent pull box
5. 2 inches from overhead sign to adjacent pull box
6. 2 inches from service equipment enclosure to adjacent pull box
7. 1-1/2 inches if unspecified

Two conduits must be installed between controller cabinet and adjacent pull box.

86-2.05C Installation

Whether shop or field cut, ream ends of conduit to remove burrs and rough edges. Make cuts square and true. Slip joints and running threads are not allowed for coupling conduit. If a standard coupling cannot be used for coupling metal type conduit, use a threaded union coupling that is UL or NRTL listed. Tighten couplings for metal conduit to maintain a good electrical connection through conduit run.

Cut Type 3 conduit with tools that will not deform the conduit. Use solvent weld for connections.

Cut Type 2 conduit with pipe cutters; do not use hacksaws. Coated conduit must be threaded with standard conduit-threading dies. Tighten conduit into couplings or fittings using strap wrenches or approved groove-joint pliers.

Protect shop-cut threads from corrosion as follows:

Shop-Cut Thread Protection

Steel conduit and conduit couplings	ANSI C80.1
Electrical intermediate metal conduit and conduit couplings	ANSI C80.6

Paint conduits as specified in Section 91, "Paint." Apply 2 coats of approved unthinned zinc-rich primer of organic vehicle type. Do not use aerosol cans. Paint the following parts of conduits:

1. All exposed threads
2. Field-cut threads before installing conduit couplings to steel conduit
3. Damaged surfaces on metal conduit

Do not remove shop-installed conduit couplings.

Damaged Type 2 conduit or conduit coupling must be wrapped with at least 1 layer of 2 inch wide, 20 mil minimum thickness PVC tape, as specified in ASTM D 1000, with a minimum tape overlap of 1/2 inch. Before applying the tape, conduit or fitting must be cleaned and painted with 1 coat of rubber-resin based adhesive as recommended by the tape manufacturer. You may repair damaged spots in the thermoplastic coating by painting over with a brushing type compound supplied by the conduit manufacturer instead of the tape wrap.

The ends of Types 1, 2, or 5 conduit must be threaded and capped with standard pipe caps until wiring is started. The ends of Types 3 and 4 conduit must be capped until wiring is started. If caps are removed, replace with conduit bushings. Fit insulated bonding bushings on the end of metal conduit ending in pull box or foundation. Bell or end bushings for Type 3 conduit must be non-metallic type.

Conduit bends, except factory bends, must have a radius of not less than 6 times the inside diameter of the conduit. If factory bends are not used, bend the conduit without crimping or flattening using the longest radius practicable. Bend conduits as follows:

Conduit-Bending Requirements

Type 1	By methods recommended by the conduit manufacturer and with equipment approved for the purpose.
Type 2	Use standard bending tool designed for use on thermoplastic coated conduit. Conduit must be free of burrs and pits.
Type 3	By methods recommended by the conduit manufacturer and with equipment approved for the purpose. Do not expose conduit to direct flame.
Type 4	--
Type 5	By methods recommended by the conduit manufacturer and with equipment approved for the purpose.

Install pull tape in conduit that is to receive future conductors. The pull tape must be a flat woven lubricated soft-fiber polyester tape with a minimum tensile strength of 1,800 pounds and have printed sequential measurement markings every 3 feet. At least 2 feet of pull tape must be doubled back into the conduit at each end.

Existing underground conduit to be incorporated into a new system must be cleaned with a mandrel or cylindrical wire brush and blown out with compressed air.

Install conduit to a depth of not less than 30 inches below finished grade, except in sidewalk and curbed paved median areas, where it must be at least 18 inches below grade. You may lay conduit on existing pavement within new curbed median.

Conduit coupling must be a minimum of 6 inches from face of foundation.

Place a minimum of 2 inches of sand bedding in the trench before installing Type 2 or Type 3 conduit. Place a minimum of 4 inches of same material over conduit before placing additional backfill material.

Obtain approval from the Engineer before disturbing pavement. If obstruction is encountered, obtain approval from Engineer to cut small holes in the pavement to locate or remove obstruction If jacking or drilling method is used, keep jacking or drilling pit 2 feet away from edge of pavement. Pavement must not be weakened or subgrade softened from excess water use.

Conduit used for drilling or jacking must be removed; install new conduit for completed work. If a hole larger than the conduit is pre-drilled and you install conduit by hand or by method recommended by the conduit manufacturer with equipment approved for purpose, you may install Type 2 or Type 3 conduit under pavement.

If trenching in pavement method is specified, conduit installation under pavement that is not a freeway lane or freeway to freeway connector ramp, must comply with the following:

1. Use Type 3 conduit. Place conduit under pavement in a trench approximately 2 inches wider than the outside diameter of conduit, but not exceeding 6 inches in width. Trench depth must not exceed the greater of 12 inches or conduit trade size plus 10 inches, except that at pull boxes the trench may be hand dug to required depth. The top of the installed conduit must be a minimum of 9 inches below finished grade.
2. Trenching installation must be completed before placing final pavement layer.
3. Cut pavement to be removed with a rock cutting excavator. Minimize shatter outside the removal area.
4. Place conduit in bottom of trench and backfill with minor concrete as specified in Section 90-10, "Minor Concrete.". Minor concrete must contain a minimum of 590 pounds of cementitious material per cubic yard. If the trench is in asphalt concrete pavement and pavement overlay is not placed, backfill the top 0.10 foot of trench with minor HMA.
5. Before spreading HMA, apply tack coat as specified in Section 39, "Hot Mix Asphalt."
6. Backfill trenches, except for the top 0.10 foot, by the end of each day. The top 0.10 foot must be filled within 3 days after trenching.

Conduit installed beneath railroad tracks must be:

1. Type 1 or 2
2. 1-1/2-inch minimum diameter
3. Placed a minimum depth of 42 inches below bottom of the rail

If jacking or drilling method is used, construct jacking pit to a minimum of 13 feet from the centerline of track at the near side of jacking pit. Cover jacking pit with substantial planking if left overnight.

Conduit ending in standard or pedestal must not extend more than 3 inches vertically above the foundation and must be sloped toward the handhole opening. Conduit entering through the side of non-metallic pull box must end inside the box within 2 inches of the wall and 2 inches above the bottom and be sloped toward the top of box to facilitate pulling of conductors. Conduit entering through the bottom of a pull box must end 2 inches above the bottom and be located near the end walls to leave the major portion of the box clear. At outlet, conduit must enter from the direction of the run.

Underground conduit runs, including under sidewalks, that are adjacent to gasoline service stations or other underground gasoline or diesel storage, piping, or pumps and that lead to a controller cabinet, circuit breaker panel, service, or enclosure where an arc may occur during normal operations must be sealed if the conduit is within the limits specified in the NEC for Class 1, Division 1. Use Type 1 or Type 2 conduit for these runs.

Conduit for future use in structures must be threaded and capped. Conduit leading to soffit, wall, or other lights or fixtures below pull box grade must be sealed and made watertight, except where conduit ends in a No. 9 or No. 9A pull box.

Support for conduit in or on wall or bridge superstructure must comply with the following:

1. Steel hangers, steel brackets, and other fittings must comply with Section 75-1.03, "Miscellaneous Bridge Metal."
2. Construct precast concrete conduit cradles using minor concrete and commercial quality welded wire fabric. Minor concrete must comply with Section 90-10, "Minor Concrete," and contain a minimum of 590 pounds of cementitious material per cubic yard.. The cradles must be moist cured for a minimum of 3 days. Bond precast concrete cradles to structure with epoxy adhesives specified in one of the following:

   2.1. Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete"
   2.2. Section 95-2.04, "Rapid Set Epoxy Adhesive for Pavement Markers"
   2.3. Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers"

3. Use pipe sleeve or form opening for conduit through bridge superstructure concrete. Sleeve or opening through either prestressed member or conventionally reinforced precast member must be:

   3.1. Transverse to the member
   3.2. Through the web
   3.3. Not more than 3 inches maximum gross opening in concrete

4. Where conduits pass through the abutment concrete, wrap conduit with 2 layers of asphalt-felt building paper securely taped or wired in place. Fill space around conduit that runs through bridge abutment wall with mortar as specified in Section 51-1.135, "Mortar," except the proportion of cementitious material to sand must be 1 to 3. Fill the space around conduits that run through abutments after prestressing is completed.
5. Run surface-mounted conduit straight and true, horizontal or vertical on the wall, and parallel to wall on ceiling or other similar surfaces. Support conduit at a maximum of 5-foot intervals or closer where necessary to prevent vibration or unsightly deflection. The supports must include galvanized malleable iron conduit clamps and clamp backs secured with expansion anchorage devices as specified for concrete anchorage devices in Section 75-1.03, "Miscellaneous Bridge Metal." Threaded studs must be galvanized and be of the largest diameter that will pass through the mounting hole in conduit clamp.
6. Where pull boxes are placed in conduit runs, conduit must be fitted with threaded bushings and bonded.
7. Mark location of conduit end in structure, curb, or wall with a "Y" that is a minimum of 3 inches tall, directly above conduit.

86-2.05D Expansion Fittings

Install expansion fitting where the conduit crosses an expansion joint in structure. Each expansion fitting for metal conduit must include a copper bonding jumper having the ampacity specified in NEC.

Each expansion-deflection fitting for expansion joints of 1-1/2-inch movement rating must be watertight and include a molded neoprene sleeve, a bonding jumper, and 2 silicon bronze or zinc-plated iron hubs. Each fitting must allow a minimum of 3/4-inch expansion, contraction, and lateral deflection.

86-2.06 PULL BOXES

86-2.06A (Blank)

86-2.06B Cover Marking

Marking must be clearly defined, uniform in depth, and parallel to either the long or short sides of cover.
Marking letters must be 1 inch to 3 inches high.
Before galvanizing steel or cast iron cover, apply marking by one of the following methods:

1. Use cast iron strip at least 1/4 inch thick with letters raised a minimum of 1/16 inch. Fasten strip to cover with 1/4 inch flathead stainless steel machine bolts and nuts. Peen bolts after tightening.
2. Use sheet steel strip at least 0.027-inch thick with letters raised a minimum of 1/16 inch. Fasten strip to cover by spot welding, tack welding, or brazing, with 1/4 inch stainless steel rivets or 1/4 inch roundhead stainless steel machine bolts and nuts. Peen bolts after tightening.
3. Bead weld the letters on cover so that letters are raised a minimum of 3/32 inch.

86-2.06C Installation and Use

Space pull boxes no more than 200 feet apart. You may install additional pull boxes to facilitate the work.
You may use a larger standard size pull box than that shown on the plans or specified.
A pull box in ground or sidewalk area must be installed as follows:

1. Embed bottom of pull box in crushed rock.
2. Place a layer of roofing paper on the crushed rock.
3. Place mortar over the layer of roofing paper. Mortar must be 0.50 inch to 1 inch thick and sloped toward the drain hole.
4. Make a 1-inch drain hole in center of pull box through mortar and roofing paper.
5. Place mortar between pull box and pull box extension, and around conduits.

The top of the pull box must be flush with the surrounding grade or the top of an adjacent curb, except in unpaved areas where the pull box is not immediately adjacent to and protected by a concrete foundation, pole, or other protective construction. Place the pull box 1-1/4 inches above the surrounding grade. Where practical, place a pull box shown in the vicinity of curbs or adjacent to a standard on the side of the foundation facing away from traffic, unless otherwise directed. If a pull box is installed in a sidewalk area, adjust the depth of the pull box so that the top of the pull box is flush with the sidewalk.

Reconstruct the sump of an existing pull box if it is disturbed by your operations. Remove old grout and replace with new if the sump was grouted.

86-2.07 TRAFFIC PULL BOXES

Comply with Sections 86-2.06B, "Cover Marking," and 86-2.06C, "Installation and Use."

Traffic pull box and cover must comply with ASTM C857, "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures," for HS20-44 loading. You must be able to place the load anywhere on box and cover for 1 minute without causing cracks or permanent deformations.

Frame must be anchored to the box with 1/4" x 2-1/4" concrete anchors. Four concrete anchors must be included for No. 3-1/2(T) pull box; one placed in each corner. Six concrete anchors for must be included for No. 5(T) and No. 6(T) pull boxes; one placed in each corner and one near the middle of each of the longer sides.

Nuts must be zinc plated carbon steel, vibration resistant, and have a wedge ramp at the root of the thread.

After installation of traffic pull box, install steel cover and keep bolted down when your activities are not in progress at the pull box. When steel cover is placed for final time, cover and Z bar frame must be cleaned of debris and tightened securely.

Steel cover must be countersunk approximately 1/4 inch to accommodate bolt head. When tightened, bolt head must not exceed more than 1/8 inch above the top of cover.

Concrete placed around and under traffic pull box must be minor concrete as specified in Section 90-10, "Minor Concrete."

86-2.08 CONDUCTORS AND CABLES

Conductor must be copper wire that complies with ASTM B 3 and B 8.
Wire size must comply with the following:

Wire Size Requirements

Conductor usage	Requirement
In loop detector lead-in cable	ASTM B 286
Everywhere except in loop detector lead-in cable	American Wire Gage (AWG)[a]

[a]Except conductor diameter must not be less than 98 percent of specified AWG diameter.

Single conductor and cable, except detector lead-in cable, must have clear, distinctive, and permanent markings on the outer surface throughout its length. The markings must include the manufacturer's name or trademark, insulation type letter designation, conductor size, voltage, and temperature rating, and for cables, it must also include number of conductors.

86-2.08A Conductor Identification

Conductor insulation must be a solid color with a permanent stripe as specified below. The solid color must be homogeneous through the full depth of insulation. Identification stripe must be continuous throughout the length of conductor. For conductor sizes No. 2 and larger, the insulation may be black and the ends of the conductors must be taped for a minimum length of 20 inches with electrical insulating tape of the required color.

Conductor Identification

Circuit	Signal Phase or Function	Identification			Size
		Insulation Color[i]			
		Base	Stripe[a]	Band Symbols[f]	
Vehicle Signals[a,b,d]	2,6	Red, Yel, Brn	Blk	2,6	14
	4,8	Red, Yel, Brn	Ora	4,8	14
	1,5	Red, Yel, Brn	None	1,5	14
	3,7	Red, Yel, Brn	Pur	3,7	14
	Ramp Meter 1	Red, Yel, Brn	None	NBR	14
	Ramp Meter 2	Red, Yel, Brn	Blk	NBR	14
Pedestrian Signals[d]	2p,6p	Red, Brn	Blk	2p,6p	14
	4p,8p	Red, Brn	Ora	4p,8p	14
	1p,5p	Red, Brn	None	1p,5p	14
	3p,7p	Red, Brn	Pur	3p,7p	14
Pedestrian Push Buttons[d]	2p,6p	Blu	Blk	P-2,P-6	14
	4p,8p	Blu	Ora	P-4,P-8	14
	1p,5p	Blu	None	P-1,P-5	14
	3p,7p	Blu	Pur	P-3,P-7	14
Traffic Signal Controller Cabinet	Ungrounded Circuit Conductor	Blk	None	CON-1	6
	Grounded Circuit Conductor	Wht	None	CON-2	6
Highway Lighting Pull Box to Luminaire	Ungrounded-Line 1	Blk	None	NBR	14
	Ungrounded-Line 2	Red	None	NBR	14
	Grounded	Wht	None	NBR	14
Multiple Highway Lighting	Ungrounded-Line 1	Blk	None	ML1	10
	Ungrounded-Line 2	Red	None	ML2	10
Lighting Control	Ungrounded to PEU	Blk	None	C1	14
	Switching leg from PEU unit or SM transformer	Red	None	C2	14

Service	Ungrounded-Line 1 (Signals)	Blk	None	NBR[e]	6
	Ungrounded-Line 2 (Lighting)	Red[h]	None	NBR[e]	8
Sign Lighting	Ungrounded-Line 1	Blk	None	SL-1	10
	Ungrounded-Line 2	Red	None	SL-2	10
Flashing Beacons[g]	Ungrounded between Flasher and Beacons	Red or Yel	None	F-Loc.[c]	14
Grounded and Common	Pedestrian Push Buttons	Wht	Blk	NBR	14
	Signals and Multiple Lighting	Wht	None	NBR	10
	Flashing Beacons and Sign Lighting	Wht	None	NBR	12
	Lighting Control	Wht	None	C-3	14
	Multiple Service	Wht	None	NBR	14
Railroad Preemption		Blk	None	R	14
Spares		Blk	None	NBR	14

NBR = No Band Required PEU=Photoelectric unit
[a]On overlaps, insulation is striped for 1st phase in designation. e.g., phase (2+3) conductor is striped as for phase 2.
[b]Band for overlap and special phases as required.
[c]Flashing beacons having separate service do not require banding.
[d]These requirements do not apply to signal cable.
[e]"S" if circuit is switched on line side of service equipment by utility.
[f]Band conductors in each pull box and near ends of termination points. On signal light circuits, a single band may be placed around 2 or 3 ungrounded conductors comprising a phase.
[g]Ungrounded conductors between service switch and flasher mechanism must be black and banded.
[h]Black acceptable for size No. 2 and larger. Tape ends for 20 inches with indicated color.
[i]Color Code: Yel-Yellow, Brn-Brown, Blu-Blue, Blk-Black, Wht-White, Ora-Orange, Pur-Purple.

86-2.08B Multiple Circuit Conductors

Conductor for multiple circuit must be UL or NRTL listed and rated for 600 V(ac) operation. Insulation for No. 14 to No. 4 conductors must be one of the following:

1. Type TW PVC as specified in ASTM D 2219
2. Type THW PVC
3. Type USE, RHH, or RHW cross-linked polyethylene

Minimum insulation thickness must comply with the following:

Insulation Thickness

Insulation Type	Conductor Size	Insulation Thickness (mils)
USE, RHH, or RHW	No. 14 to No. 10	39
	No. 8 to No. 2	51
THW or TW	No. 14 to No. 10	27
	No. 8	40
	No. 6 to No. 2	54

Insulation for No. 2 and larger conductor must be one of the types listed above or Type THWN.

Conductor for wiring wall and soffit luminaire must be stranded copper with insulation rated for use at temperatures up to 125 °C.

86-2.08C Signal Cable

Signal cable, except for the 28-conductor type, must:

1. Not be spliced

2. Be marked in each pull box with the signal standard information it is connecting to

Signal cable must comply with the following:

1. Cable jacket must be:

   1.1. Black polyethylene with an inner polyester binder sheath
   1.2. Rated for 600 V(ac) and 75 °C

2. Filler material, if used, must be polyethylene material.
3. Conductor must be solid copper with Type THWN insulation as specified in Section 86-2.08, "Conductors and Cables," and ASTM B 286. The minimum thickness of Type THWN insulation must be 12 mils for conductor sizes No. 14 to No. 12 and 16 mils for conductor size No. 10. The minimum thickness of nylon jacket must be 4 mils.

Conductor Signal Cable Requirements

Cable Type[a]	Conductor Quantity and Type	Cable Jacket Thickness (mils)		Maximum Nominal Outside Diameter (inch)	Conductor Color Code	Remarks
		Average	Minimum			
3CSC	3 - No. 14	44	36	0.40	blue/black, blue/orange, white/black stripe	Use for pedestrian push buttons and spare
5CSC	5 - No. 14	44	36	0.50	red, yellow, brown, black, white	
9CSC	8 - No. 14 1 - No. 12	60	48	0.65	No. 12 - white No. 14 - red, yellow, brown, black, and red/black, yellow/black, brown/black, white/black stripe	
12CSC	11 - No. 14 1 - No. 12	60	48	0.80	No. 12 - white No. 14 - see "12CSC Color Code and Functional Connection" table	Use for vehicle signals, pedestrian signals, spares, and signal common
28CSC	27 - No. 14 1 - No. 10	80	64	0.90	No. 10 - white No. 14 - see "28CSC Color Code and Functional Connection" table	Keep signal commons in each cable separate except at the signal controller. Label each cable as "C1" or "C2" in pull box. Use "C1" for signal phases 1, 2, 3, and 4. Use "C2" for phases 5, 6, 7, and 8.

[a]Conductor signal cable description starts with the number of conductors, followed by "CSC".
(e.g., a signal cable with 3 conductors is labeled "3CSC.")

12CSC Color Code and Functional Connection

Color Code	Termination	Phase
Red	Vehicle signal red	2, 4, 6, or 8
Yellow	Vehicle signal yellow	2, 4, 6, or 8
Brown	Vehicle signal green	2, 4, 6, or 8
Red/black stripe	Vehicle signal red	1, 3, 5, or 7
Yellow/black stripe	Vehicle signal yellow	1, 3, 5, or 7
Brown/black stripe	Vehicle signal green	1, 3, 5, or 7
Black/red stripe	Spare, or use as required for red or DONT WALK	
Black/white stripe	Spare, or use as required for yellow	
Black	Spare, or use as required for green or WALK	
Red/white stripe	Ped signal DONT WALK	
Brown/white stripe	Ped signal WALK	

28CSC Color Code and Functional Connection

Color Code	Termination	Phase
Red/black stripe	Vehicle signal red	2 or 6
Yellow/black stripe	Vehicle signal yellow	2 or 6
Brown/black stripe	Vehicle signal green	2 or 6
Red/orange stripe	Vehicle signal red	4 or 8
Yellow/orange stripe	Vehicle signal yellow	4 or 8
Brown/orange stripe	Vehicle signal green	4 or 8
Red/silver stripe	Vehicle signal red	1 or 5
Yellow/silver stripe	Vehicle signal yellow	1 or 5
Brown/silver stripe	Vehicle signal green	1 or 5
Red/purple stripe	Vehicle signal red	3 or 7
Yellow/purple stripe	Vehicle signal yellow	3 or 7
Brown/purple stripe	Vehicle signal green	3 or 7
Red/2 black stripes	Ped signal DONT WALK	2 or 6
Brown/2 black stripes	Ped signal WALK	2 or 6
Red/2 orange stripes	Ped signal DONT WALK	4 or 8
Brown/2 orange stripes	Ped signal WALK	4 or 8
Red/2 silver stripes	Overlap A, C red	OLA, OLC
Brown/2 silver stripes	Overlap A, C green	OLA, OLC
Red/2 purple stripes	Overlap B, D red	OLB, OLD
Brown/2 purple stripes	Overlap B, D green	OLB, OLD
Blue/black stripe	Ped push button	2 or 6
Blue/orange stripe	Ped push button	4 or 8
Blue/silver stripe	Overlap A, C yellow	OLA(y), OLC(y)
Blue/purple stripe	Overlap B, D yellow	OLB(y), OLD(y)
White/black stripe	Ped push button common	
Black/red stripe	Railroad preemption	
Black	Spare	

86-2.08D Signal Interconnect Cable (SIC)

Signal interconnect cable must be a 3-pair or 6-pair type with stranded tinned copper No. 20 conductors. Each conductor insulation must be 13 mils minimum nominal thickness, color-coded, polypropylene material. Conductors must be in twisted pairs. Color coding distinguishes each pair. Each pair must be wrapped with an aluminum polyester shield and must have a No. 22 or larger stranded tinned copper drain wire inside the shielded pair.

Cable jacket must be black, high density polyethylene, rated for a minimum of 300 V(ac) and 60 °C, and must have a minimum nominal wall thickness of 40 mils. Cable jacket or moisture-resistant tape directly under the outer jacket must be marked as specified in Section 86-2.08.

You must have a minimum of 6 feet of slack at each controller cabinet. Splicing is allowed only if shown on the plans.

Insulate conductor splice with heat-shrink tubing and overlap at least 0.6 inch. Cover overall cable splice with heat-shrink tubing and overlap the cable jacket at least 1-1/2 inch.

86-2.09 WIRING

Run conductors in conduit, except for overhead and temporary installations and where conductors are run inside poles.

Solder by hot iron, pouring, or dipping method, connectors and terminal lugs for conductor sizes No. 8 and smaller. Do not perform open-flame soldering.

86-2.09A Circuitry

Do not run traffic signal indication conductors to a terminal block on a standard unless connected to a mounted signal head.

Use only 1 conductor to connect to each terminal of a pedestrian push button.

The common for pedestrian push button circuit must be separate from traffic signal circuit grounded conductor.

86-2.09B Installation

Use a UL- or NRTL-listed inert lubricant for placing conductors in conduit.

Pull conductors into conduit by hand using pull tape specified in Section 86-2.05C, "Installation." Do not use winches or other power-actuated pulling equipment.

If adding new conductors or removing existing conductors, remove all conductors, clean conduit as specified in Section 86-2.05C, "Installation," and pull all conductors in conduit as 1 unit.

If traffic signal conductors are run in lighting standard containing street lighting conductors from a different service point, you must encase the traffic signal conductors or the lighting conductors with a flexible or rigid metal conduit for a length until the 2 types of conductors are no longer in the same raceway.

If less than 10 feet above grade, enclose temporary conductors in flexible or rigid metal conduit.

Leave slack for each conductor as follows:

Conductor Slack Requirements

Location	Slack (feet)
Signal standard	1
Lighting standard	1
Signal and lighting standard	1
Pull box	3
Splice	3
Standards with slip base	0

After conductors are installed, seal ends of conduits with an approved sealing compound.

To form a watertight seal, tape ends of spare conductors and conductors ending in pull boxes.

Conductors and cables inside fixture or cabinet must be neatly arranged and tied together by function with self-clinching nylon cable ties or enclosed in plastic tubing or raceway.

Identify conductors for signal overlap phase as specified for vehicle signals in the table titled "Conductor Identification."

Permanently identify conductors by function. Place identification on each conductor, or each group of conductors forming a signal phase, at each pull box and near the end of conductors.

Label, tag, or band conductors by mechanical methods. Identification must not move along the conductors.

86-2.09C Connectors and Terminals

Connectors and terminals must be UL- or NRTL-listed crimp type. Use manufacturer-recommended tool for connectors and terminals to join conductors. Comply with MIL-T-7928.

Terminate stranded conductors smaller than No. 14 in crimp style terminal lugs.

86-2.09D Splicing and Terminations

Splices are allowed for:

1. Grounded conductors in pull box.
2. Pedestrian push button conductors in pull box.
3. Conductors in pull box adjacent to each electrolier or luminaire.
4. Ungrounded traffic signal conductors in pull box, if traffic signals are modified.

5. Ungrounded traffic signal conductors to a terminal compartment or signal head on a standard with conductors of the same phase in the pull box adjacent to the standard.
6. Ungrounded lighting circuit conductors in pull box, if lighting circuits are modified.

86-2.09E Splice Insulation

Splice must function under continuous submersion in water.

Multi-conductor cable must be spliced and insulated to form a watertight joint and to prevent moisture absorption by the cable.

Low-voltage tape must be:

1. UL or NRTL listed
2. Self-fusing, oil and flame-resistant, synthetic rubber
3. PVC, pressure-sensitive adhesive of 6 mils minimum thickness

Insulating pad must be a combination of an 80-mils thick electrical grade PVC laminate and a 120-mils thick butyl splicing compound with removable liner.

Heat-shrink tubing must comply with the following:

1. Be medium or heavy wall thickness, irradiated polyolefin tubing with an adhesive mastic inner wall.
2. Before contraction, minimum wall thickness must be 40 mils.
3. Heating must be as recommended by the manufacturer. Do not perform open-flame heating.
4. When heated, the inner wall must melt and fill crevices and interstices of the covered object and the outer wall must shrink to form a waterproof insulation.
5. After contraction, each end of the heat-shrink tubing or the open end of end cap of heat-shrink tubing must overlap the conductor insulation at least 1-1/2 inches. Coat ends and seams with electrical insulation coating.
6. Comply with requirements for extruded insulated tubing at 600 V(ac) in UL Standard 468D and ANSI C119.1, and the following requirements:

Heat-Shrink Tubing Requirements

Shrinkage Ratio	33 percent, maximum, of supplied diameter when heated to 125 °C and allowed to cool to 25 °C
Dielectric Strength	350 kV per inch, minimum
Resistivity	25^{13} Ω per inch, minimum
Tensile Strength	2,000 psi, minimum
Operating Temperature	-40 °C to 90 °C (135 °C in emergency)
Water Absorption	0.5 percent, maximum

7. If 3 or more conductors are to be enclosed in 1 splice, place mastic around each conductor before placing inside tubing. Use mastic type recommended by heat-shrink tubing manufacturer.

You may use "Method B" as an alternative method for splice insulation. Use at least 2 thicknesses of electrical insulating pad. Apply pad to splice as recommended by manufacturer.

86-2.095 FUSED SPLICE CONNECTORS

Install a fused disconnect splice connector in each ungrounded conductor, between the line and the ballast, in the pull box adjacent to each luminaire. Connector must be accessible in the pull box.

For 240 and 480 V(ac) circuits, each connector must simultaneously disconnect both ungrounded conductors. Connector must not have exposed metal parts, except for the head of stainless steel assembly screw. Recess head of stainless steel assembly screw a minimum of 1/32 inch below top of plastic boss that surrounds the head.

Splice connector must protect fuse from water or weather damage. Contact between fuse and fuseholder must be spring loaded. Splice connector terminals must be:

1. Rigidly crimped, using a tool recommended by manufacturer of fused splice connector, onto ungrounded conductors
2. Insulated
3. Watertight

Fuses must be standard midget ferrule type, with "Non-Time-Delay" feature, and 13/32" x 1-1/2".

86-2.10 BONDING AND GROUNDING

Secure all metallic components, mechanically and electrically, to form a continuous system that is effectively grounded.

Bonding jumper must be copper wire or copper braid of the same cross sectional area as a No. 8 or larger to match the load. Equipment grounding conductors must be color coded as specified in NEC or be bare.

Attach bonding jumper to standard as follows:

Bonding Jumper Attachment

Standard type	Requirements
Standard with handhole and traffic pull box lid cover	Use UL-listed lug and 3/16-inch diameter or larger brass or bronze bolt. Run jumper to conduit or bonding wire in adjacent pull box. Grounding jumper must be visible after the standard is installed and mortar pad is placed on foundation.
Standard without handhole	Use UL-listed ground clamp on each anchor bolt.
Slip-base standard	Use UL-listed ground clamp on each anchor bolt or attach UL-listed lug to bottom slip-base plate with 3/16-inch diameter or larger brass or bronze bolt.

Ground one side of secondary circuit of step-down transformer.

Ground metal conduit, service equipment, and grounded conductor at service point as specified by NEC and service utility, except grounding electrode conductor must be No. 6 or larger.

Equipment bonding and grounding conductors are required in conduit. Run a No. 8 minimum bare copper wire continuously in conduit system. The bonding wire must be sized as specified in the NEC.

Ground electrode must be:

1. 1 piece
2. 10-foot minimum length of one of the following:

    2.1. Galvanized steel rod or pipe not less than 3/4 inch in diameter
    2.2. Copper clad steel rod not less than 5/8 inch in diameter

3. Installed as specified in NEC
4. Bonded to service equipment using one of the following:

    4.1. Ground clamp
    4.2. Exothermic weld
    4.3. No. 6 or larger copper conductor

On wood pole, metallic equipment mounted less than 8 feet above ground surface must be grounded.

Bond metallic conduit in non-metallic pull box using bonding bushing or bonding jumper.

Bond metallic conduit in metal pull box using bonding bushings and bonding jumpers connected to bonding wire running in the conduit system.

86-2.11 SERVICE

Electrical service installation and materials must comply with service utility requirements.

If service equipment is to be installed on utility-owned pole, you must furnish and install conduit, conductors, and other necessary material to complete service installation. Service utility will decide riser and equipment position.

Install service equipment early on to allow service utility to schedule its work before project completion.

Furnish each service with a circuit breaker that simultaneously disconnects all ungrounded service entrance conductors.

Circuit breakers must:

1. Be quick-break on either automatic or manual operation.
2. Have operating mechanism that is enclosed and trip-free from operating handle on overload.

3. Be trip indicating.
4. Have frame size plainly marked.
5. Have trip rating clearly marked on operating handle.
6. Have overload tripping of breakers not influenced by ambient temperature range of -18 °C to 50 °C.
7. Be internal trip type.
8. Be UL or NRTL listed and comply with UL 489 or equal.
9. Have minimum interrupting capacity of 10,000 A, rms, if used as service disconnect.

Service equipment enclosure must be a NEMA 3R enclosure with dead-front panel and a hasp with a 7/16-inch hole for a padlock. Enclosure must be field marked as specified in the NEC to warn qualified persons of potential electric arc flash hazards.

Service equipment enclosure, except Types II and III, must be galvanized or have a factory-applied rust-resistant prime coat and finish coat.

Types II and III service equipment enclosures must be manufactured from one of the following:

1. Galvanized sheet steel
2. Sheet steel plated with zinc or cadmium after manufacturing
3. Aluminum

Manufacture service equipment enclosure as specified in Section 86-3.04A, "Cabinet Construction." Overlapping exterior seams and doors must comply with requirements for NEMA 3R enclosures in the NEMA Enclosure Standards.

If an alternative design is proposed for Type II or III service equipment enclosure, submit plans and shop drawings to the Engineer for approval before manufacturing.

Except for falsework lighting and power for your activities, when you submit a written request, the Engineer will arrange:

1. With the service utility to complete service connections for permanent installations and the Department will pay all costs and fees required by the service utility. Submit request at least 15 days before service connections are required.
2. For furnishing electrical energy. Energy used before contract completion will be charged to you, except cost of energy used for public benefit as ordered by the Engineer will be paid by the Department or local authorities.

Full compensation for furnishing and installing State-owned or permanent service poles, service equipment, conduit, conductors, and pull boxes, including equipment, conduit, and conductors placed on utility-owned poles, is included in the contract item of electrical work involved and no additional compensation will be allowed therefor.

If the service point is indeterminate and is shown on the plans as "approximate location" or "service point not yet established," the labor and materials required for making the connection between the service point, when established, and the nearest pull box shown on the plans will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

86-2.12 WOOD POLES

Wood poles must comply with the following:

1. Class 5 or larger as specified in ANSI O 5.1
2. Less than 180-degree twist in grain over the full length
3. 4-inch or less sweep
4. Beveled top
5. Placed in ground at least 6 feet
6. Length must be:

    6.1. 25 feet for service pole
    6.2. 35 feet for other

After each pole is set in ground, backfill space around pole with selected earth or sand, free of rocks and other deleterious material, placed in 4-inch thick layers. Moisten each layer and thoroughly compact.

Manufacture mast arm from standard pipe, free from burrs. Each mast arm must have an insulated wire inlet and wood pole mounting brackets for mast arm and tie-rod cross arm. Manufacture tie rod from structural steel and pipe.

Mount mast arm for luminaire to provide a 34-foot mounting height for a 200 W high pressure sodium luminaire and 40-foot mounting height for 310 W high pressure sodium luminaire. Traffic signals and flashing beacons on mast arm must provide a minimum vertical clearance of 17 feet from bottom of equipment to pavement.

After manufacturing, pressure-treat pole as specified in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPA Use Category System: UC4B, Commodity Specification D.

If specified, treat pole with waterborne wood preservative.

86-2.13 LIGHTING AND SIGN ILLUMINATION CONTROL

Enclosure for the circuit breaker for lighting and sign illumination control must:

1. Be NEMA 3R
2. Be galvanized, cadmium plated, or powder-coated
3. Include dead front panel and a hasp with a 7/16 inch diameter hole for padlock

86-2.14 TESTING

86-2.14A Materials Testing

Deliver material and equipment to be tested to either the Transportation Laboratory or a testing location ordered by the Engineer.

Allow 30 days for acceptance testing from the time material or equipment is delivered to test site. You must pay for all shipping, handling, and related transportation costs associated with testing. If equipment is rejected, you must allow 30 days for retesting. Retesting period starts when corrected equipment is delivered to test site. You must pay for all retesting costs. Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time.

If equipment submitted for testing does not comply with specifications, remove the equipment within 5 business days after notification that the equipment is rejected. If equipment is not removed within that period, it may be shipped to you at your expense.

When testing is complete, you will be notified. You must pick up the equipment at the test site and deliver it to the job site.

Testing and quality control procedures for all other traffic signal controller assemblies must comply with NEMA TS Standards for Traffic Control Systems.

86-2.14B Field Testing

Before starting functional testing, perform the following tests in the presence of the Engineer:

86-2.14B(1) Continuity

Test each circuit for continuity.

86-2.14B(2) Ground

Test each circuit for grounds.

86-2.14B(3) Insulation Resistance

Perform insulation resistance test at 500 V(dc) on each circuit between the circuit and a ground. Insulation resistance must be 10 MΩ minimum on all circuits, except for inductive loop detector circuits that must have an insulation resistance value at least 100 MΩ.

86-2.14C Functional Testing

Test periods must comply with Section 86-1.07, "Scheduling of Work."

Acceptance of new or modified traffic signal will be made only after all traffic signal circuits have been thoroughly tested.

Perform functional test to show that each part of the system functions as specified.

Functional test for each new or modified system must include at least 5 business days of continuous, satisfactory operation. If unsatisfactory performance of the system occurs, the condition must be corrected and the system retested until the 5 business days of continuous, satisfactory operation is obtained.

Except for new or modified parts of existing lighting circuit and sign illumination system, the State or local agency will maintain the system during test period and pay the electrical energy cost. Except for electrical energy, you must pay the cost of necessary maintenance performed by the State or local agency on new circuits or on the portions of existing circuits modified under the contract.

Shutdown of electrical system caused by traffic from a power interruption or from unsatisfactory performance of State-furnished materials does not constitute discontinuity of the functional test.

86-2.15 GALVANIZING

Galvanize as specified in Section 75-1.05, "Galvanizing." Cabinet material may be galvanized before manufacturing as specified in ASTM A 653/653M, Coating Designation G 90.

Steel pipe standard and pipe mast arm must be hot-dip galvanized after manufacturing and must comply with Section 75-1.05, "Galvanizing." . Remove spikes from galvanized surfaces.

A minimum of 10 inches of upper end of anchor bolts, anchor bars or studs, and nuts and washers must be galvanized as specified in Section 75-1.05, "Galvanizing."

After galvanizing, bolt threads must accept galvanized standard nuts without requiring tools or causing removal of protective coatings.

Galvanizing existing materials in an electrical installation will not be required.

86-2.16 PAINTING

Paint electrical equipment and material as specified in Section 59, "Painting," and the following:

1. Use paint material specified in Section 91, "Paint."
2. Factory or shop cleaning methods for metals are acceptable if equal to the methods specified.
3. Instead of temperature and seasonal restrictions for painting as specified in Section 59, "Painting," paint may be applied to equipment and materials for electrical installations if ordered by the Engineer.
4. Ungalvanized ferrous surface to be painted must be cleaned before applying prime coat. Blast cleaning is not required.
5. If an approved prime coat is applied by manufacturer, and in good condition, the 1st primer application is not required.
6. Existing equipment to be painted in the field, including State-furnished equipment, must be washed with a stiff bristle brush using a solution of water containing 2 tablespoons of heavy duty detergent powder per gallon. After rinsing, surface must be wire-brushed with a coarse, cup-shaped, power-driven brush to remove badly bonded paint, rust, scale, corrosion, grease, or dirt. Dust or residue remaining after wire brushing must be removed before priming.
7. Do not paint galvanized metal guard post, galvanized equipment, State-furnished controller cabinet, and wood poles for traffic signal or flashing beacon.
8. New galvanized metal surface to be painted in the field must be cleaned as specified for existing equipment before applying the prime coat. Do not wire brush new galvanized surface.
9. After erection, examine exterior surface for damaged primer, clean, and spot coat with primer.
10. Paint Types II and III steel service equipment enclosures with a polymeric or an enamel coating system matching Color No. 14672, light green, of Federal Standard 595B. Coating must be commercially smooth and free of flow lines, paint washout, streaks, blisters, and other defects that would impair serviceability or detract from general appearance. Coating must comply with the following:

    10.1. Coating hardness - Finish must have pencil lead hardness of HB, minimum, using an Eagle Turquoise pencil.
    10.2. Salt spray resistance - Undercutting coating system's film must not exceed 1/8-inch average, from lines scored diagonally and deep enough to expose the base metal, after 336 hours of exposure in a salt spray cabinet complying with ASTM B 117.
    10.3. Adherence - Must not have coating loss when tested as specified in California Test 645. Perform testing by applying coating to 4" x 8" x 0.024" test specimens of the same material as the cabinet, using the same application method.

11. Finish interior of metal signal visor, louver, and front face of back plates with 2 applications of lusterless black exterior grade latex paint formulated for application to properly prepared metal surface. Good condition factory finish will be acceptable.
12. Finish metal signal section, signal head mounting, brackets and fittings, outside of visor, pedestrian push button housing, pedestrian signal section and visor, and back face of back plate with 2 applications of

lusterless black or dark olive green exterior grade latex paint formulated for application to properly prepared metal surface. Match dark olive green color to Color Chip No. 68 filed at the Transportation Laboratory.

13. Prepare and finish conduit and conduit fitting above ground the same as adjacent standard or post.
14. Relocated, reset or modified equipment previously finished as specified in this section, except for previously-finished galvanized standard with traffic signal yellow enamel, must be given a spot finishing application on newly primed areas and 1 finishing application over the entire surface. If signal face or mounting brackets are required to be painted under this section, all signal faces and mounting brackets on the same mounting must be repainted.
15. Small rusted or repaired areas of relocated or reset galvanized equipment must be cleaned and painted as specified in Section 75-1.05, "Galvanizing," for repairing damaged galvanized surfaces.
16. Stencil equipment number neatly on the standard or adjacent structure. Obtain number from the Engineer.
17. Perform painting neatly. The Engineer reserves the right to require use of brushes if the work performed by paint spraying machine is unsatisfactory.

86-3 CONTROLLER ASSEMBLIES

86-3.01 CONTROLLER ASSEMBLIES

A controller assembly houses a complete mechanism for controlling the operation of traffic signals or other systems.

Model 170 and Model 2070, specified as a Model 170/2070 controller assembly, includes a Model 170, 170E or 2070 controller unit, a wired cabinet, and all auxiliary equipment required to control the system.

86-3.02 (BLANK)

86-3.03 (BLANK)

86-3.04 CONTROLLER CABINETS

Controller cabinets for controller assemblies other than Model 170/2070 must comply with the following:

86-3.04A Cabinet Construction

Cabinet must be rainproof and the top crowned 1/2 inch or slanted toward the back to prevent standing water.
Cabinet and door must be manufactured from one of the following:

1. 0.073-inch minimum thickness cold-rolled steel with continuously-welded exterior seams
2. 0.073-inch minimum thickness stainless steel with overlapping exterior seams complying with Type 4 enclosures of the NEMA Enclosure Standards
3. 0.125-inch minimum thickness aluminum with continuously-welded exterior seams

Exterior welds must be ground smooth and edges filed to a radius of at least 0.03 inch.
Cabinet manufactured from cold-rolled steel must comply with Section 86-2.16, "Painting," and the following:

1. Cabinet manufactured from cold-rolled steel must be finished with a polymeric or an enamel coating system conforming to Color No. 14672 of Federal Standard 595B.
2. Cabinet must not have coating loss when 2 test specimens, 4" x 8", of the same material and coating as the cabinet are tested. Two 9-inch-diagonal scratches exposing bare metal will be made on a specimen. Soak specimen in demineralized water for 192 hours. Tightly affix a 1-inch wide strip of masking tape to the surface and remove with one quick motion. Specimen showing evidence of blistering, softening, or peeling of paint or coating from the base metal will be rejected. Testing must comply with California Test 645, except passing 180 Degree Bend Test is not required.
3. Metal must be prepared by the 3-step, iron phosphate conversion coating bonderizing technique.
4. Inside walls, doors, and ceiling of the housing must be the same as the outside finish.

Cabinet manufactured from stainless steel must comply with the following:

1. Use annealed or quarter-hard stainless steel that complies with ASTM A 666 for Type 304, Grades A or B.
2. Use gas tungsten arc welding (GTAW) process with bare stainless steel welding electrodes. Electrodes must comply with AWS A5.9 for ER308 chromium-nickel bare arc welding electrodes.

3. Procedures, welder, and welding operator must comply with requirements and practices recommended in AWS C5.5.
4. Ground or brush exposed, exterior surfaces of stainless steel cabinet to a 25 to 50-microinch finish using iron-free abrasives or stainless steel brushes.
5. After grinding or brushing, cabinet must not show rust discoloration when:

    5.1. Exposed for 48 hours in a salt spray cabinet as specified in ASTM B 117
    5.2. Exposed 24 hours in a tap water spray cabinet with the water temperature between 38 °C and 45 °C

6. After the test, cabinet showing rust discoloration anywhere on its surface will be rejected. Rejected cabinets may be cleaned, passivated, and resubmitted for testing.

Cabinet manufactured from aluminum sheet must comply with ASTM B 209 or B 209M for 5052-H32 aluminum sheet, and the following:

1. Use gas metal arc welding (GMAW) process with bare aluminum welding electrodes. Electrodes must comply with AWS A5.10 for ER5356 aluminum alloy bare welding electrodes.
2. Procedures, welder, and welding operator for welding must comply with requirements in AWS B3.0, "Welding Procedure and Performance Qualification," and to practices recommended in AWS C5.6.
3. Surface finish of each aluminum cabinet must comply with MIL-A-8625 for a Type II, Class I coating, except anodic coating must have a minimum thickness of 0.0007 inch and a minimum coating weight of 0.001 ounce per square inch. The anodic coating must be sealed in a 5 percent aqueous solution of nickel acetate, pH 5.0 to 6.5, for 15 minutes at 97 °C. Before applying anodic coating, clean and etch cabinets using the steps below:

    3.1. Clean by immersing into inhibited alkaline cleaner, Oakite 61A, Diversey 909, or equal, 6 to 8 ounces per gallon at 71 °C for 5 minutes.
    3.2. Rinse in cold water.
    3.3. Etch in solution of 1-1/2 ounce of sodium fluoride and 4 to 6 ounces of sodium hydroxide per gallon of distilled water at 60 °C to 65 °C for 5 minutes.
    3.4. Rinse in cold water.
    3.5. Immerse in 50 percent by volume nitric acid solution at room temperature for 2 minutes.
    3.6. Rinse in cold water.

Cabinet must have:

1. Single front door with:

    1.1. 44-inch maximum door width.
    1.2. Lock, when closed and latched, that is locked.
    1.3. Police panel mounted on door, equipped with a keyed lock and 2 police keys. Each police key must have a shaft at least 1-3/4 inch in length.

2. Dust-tight gasketing on all door openings, permanently bonded to the metal. Mating surface of the gasketing must be covered with silicone lubricant to prevent sticking.
3. Handle that:

    3.1. Allows padlocking in closed position
    3.2. Has a minimum length of 7 inches
    3.3. Has a 5/8-inch, minimum, steel shank
    3.4. Is manufactured of cast aluminum, or zinc-plated or cadmium-plated steel

4. Cabinet door frame with:

    4.1. Latching mechanism that:

        4.1.1. Holds tension on and forms a firm seal between door gasketing and frame.
        4.1.2. Is a 3-point cabinet latch with nylon rollers that have a minimum diameter of 3/4 inch and equipped with ball bearings.

4.1.3. Has a center catch and a pushrod made of zinc-plated or cadmium-plated steel. Pushrod must be at least 1/4" x 3/4" and turned edgewise at outer supports. Cadmium plating must comply with MIL-QQ-416. Zinc plating must comply with MIL-QQ-325.

4.2. Hinging that:

4.2.1. Has 3-bolt butt hinges, each having a stainless steel fixed pin. Hinges must be stainless steel or may be aluminum for aluminum cabinet.
4.2.2. Is bolted or welded to the cabinet. Hinge pins and bolts must not be accessible when door is closed.
4.2.3. Has a catch to hold the door open at 90 degrees and 180 degrees, ± 10 degrees, if a door is larger than 22 inches in width or 6 square feet in area. Catch must be at least 3/8-inch diameter, stainless steel plated rod capable of holding door open at 90 degrees in a 60 mph wind at an angle perpendicular to the plane of the door.

5. Lock that:

5.1. Is solid brass, 6-pin tumbler, rim type
5.2. Has rectangular, spring-loaded bolts
5.3. Is left hand and rigidly mounted with stainless steel machine screws approximately 2 inches apart
5.4. Extends 1/8 to 3/8 inch beyond the outside surface of door

6. 2 keys that are removable in the locked and unlocked positions.

Submit alternative design details for review and approval before manufacturing cabinet.
Use metal shelves or brackets that will support controller unit and auxiliary equipment.
Machine screws and bolts must not protrude outside the cabinet wall.

86-3.04B Cabinet Ventilation

Each controller cabinet must have:

1. 8 screened, 1/2-inch diameter or larger, raintight vent holes, in lower side or bottom of cabinet. You may use louvered vents with a permanent metal mesh or 4-ply woven polypropylene air filter held firmly in place, instead.
2. Electric fan with ball or roller bearings and capacity of at least 100 cubic feet per minute. Fan must be thermostatically controlled and manually adjustable to turn on between 32 °C and 65 °C with a differential of not more than 6 °C between automatic turn on and turn off. Fan circuit must be fused at 125 percent of ampacity of installed fan motor.

Fan and cabinet vent holes must be positioned to direct bulk of airflow over controller unit or through ventilating holes of controller unit.

86-3.04C Cabinet Wiring

Conductors used in controller cabinet wiring must:

1. Be neatly arranged and laced, or enclosed in plastic tubing or raceway.
2. End with properly sized captive or spring-spade terminal or be soldered to a through-panel solder lug on the back side of the terminal block. Apply crimp-style connector with proper tool to prevent opening of handle until crimp is completed.

Controller cabinet must have an equipment grounding conductor bus that is grounded to the cabinet and connected to metal conduit system or other approved ground with a No. 8, or larger, grounding conductor.

With all cabinet equipment in place and connected, resistance between grounded conductor terminal bus and equipment grounding conductor bus must be 50 MΩ, minimum, when measured with an applied voltage of 150 V(dc).

If direct current is to be grounded, connect to equipment ground only.

Use two or more terminal blocks for field connection. Install field terminal within 22 inches from front of cabinet and orient for screwdriver operation. Terminal must be a minimum of 5 inches above foundation.

No more than 3 conductors per terminal are allowed. Two flat metal jumpers, straight or U shaped, may be placed under terminal screw. At least 2 full threads of terminal screws must be fully engaged when screw is tightened. Live parts must not extend beyond the barrier.

86-3.05 CABINET ACCESSORIES

86-3.05A Labels

Include permanently printed, engraved, or silk-screened label for equipment and removable items of equipment.

Labeling must match cabinet wiring diagram. Label for shelf-mounted equipment must be on shelf face below item. Label for wall-mounted equipment must be below item.

86-3.05B Convenience Receptacle

Mount convenience receptacle in a readily accessible location inside the cabinet.

Convenience receptacle must be a duplex, 3-prong, NEMA 5-15R grounding type outlet that complies with UL Standard 943.

86-3.05C Surge Arrestor

Surge arrestor must reduce effects of power line voltage transients and have ratings as follows:

Surge Arrestor Requirements

Recurrent peak voltage	184 V(ac)
Energy rating, maximum	20 J
Power dissipation, average	0.85 W
Peak current for pulses less than 7 µs	1,250 A

Standby current must be 1 mA or less for 120 V(ac), 60 Hz sinusoidal input.

86-3.05D Terminal Blocks

Terminal block must be rated 600 V(ac), minimum, and have nickel-, silver-, or cadmium-plated brass binder head screw terminal.

Heavy duty terminal block must be rated at 20 A and have 12 position with No. 10 x 5/16-inch nickel-plated brass binder head screws and nickel-plated brass inserts. Each position must have 2 screw-type terminals. Terminal block must be barrier type with shorting bars in each of the 12 positions, and must have integral type marking strips.

Light duty terminal block must be rated at 5 A and have 12 positions with No. 6 x 1/8 inch binder head screws. Each position must have 1 screw-type terminal.

86-3.06 COMPONENTS

86-3.06A Toggle Switches

Toggle switch must:

1. Have poles as required
2. Be rated at 200 percent of circuit current for circuits of 10 A or less and 125 percent of circuit current for circuits over 10 A

86-3.06B Cartridge Fuses

Install cartridge fuse in panel-mounted fuseholder. Fuse type and rating must be as recommended by the fuse manufacturer for protecting the load.

86-3.06C Circuit Breakers

Circuit breaker must comply with Section 86-2.11, "Service," except breaker must have a minimum interrupting capacity of 5,000 A, rms.

86-3.06D Connectors

Use connector designed to interconnect various parts of circuit together and constructed for the application involved. Design connector for positive connection of circuit and easy insertion and removal of mating contacts. Connector must be permanently keyed to prevent improper connection of circuit.

Connector, or device plugging into connector, must have positive connection to prevent a circuit from breaking due to vibration, a pull on connecting cable, or similar disruptive force.

86-4 TRAFFIC SIGNAL FACES AND FITTINGS

86-4.01 VEHICLE SIGNAL FACES

Each vehicle signal face must:

1. Be adjustable and allow for 360-degree rotation about vertical axis
2. Comply with ITE publication ST-017B, "Vehicle Traffic Control Signal Heads"
3. Comply with California Test 604, except for arrow and "X" faces
4. Have 3 sections arranged vertically: red at top, yellow at center, and green at bottom
5. Be of the same manufacturer and material, if more than 1 is installed at an intersection, except for programmed visibility type
6. Be sealed with neoprene gasket at top opening
7. Be LED modules

86-4.01A Signal Sections

Each signal section must comply with the following:

1. Maximum height must be 10-1/4 inches for an 8-inch section and 14-3/4 inches for a 12-inch section.
2. Housing must:

    2.1. Be either die-cast or permanent mold-cast aluminum, or if specified, be structural plastic.
    2.2. Comply with ITE publication ST-017B if die-cast or permanent mold-cast aluminum is used.
    2.3. Have a 1-piece, hinged, square-shaped door designed to allow access for relamping without the use of tools. Door must be secured to hold the door closed during loading tests. Module or lens must be watertight and mounted in the door.

3. Hinge pins, door latching devices, and other exposed hardware must be Type 304 or 305 stainless steel. Interior screws and fittings must be stainless steel, or steel with a corrosion resistant plating or coating.
4. Opening must be placed on top and bottom to receive 1-1/2-inch pipe. The 8-inch and 12-inch sections of an individual manufacturer must be capable of joining to form a signal face in any combination. This interchangeability is not required between metal and plastic sections.
5. Gaskets must be made of a material that is not affected if installed in a section with metal or plastic housing that is continuously operated for 336 hours.

Structural failure is described as follows:

Signal Section Structural Failure

Signal Section Type	Requirements	Description of Structural Failure
Metal	California Test 666	Fracture within housing assembly or deflection of more than half the lens diameter of signal section during wind load test
Plastic	California Test 605	Fracture within housing assembly or deflection of more than 10 degrees in either the vertical or horizontal plane after wind load has been removed from front of signal face, or deflection of more than 6 degrees in either the vertical or horizontal plane after wind load has been removed from back of signal face

86-4.01A(1) Metal Signal Sections

Each metal signal section must have a metal visor. Metal signal faces requiring backplates must have metal backplates.

86-4.01A(2) Plastic Signal Sections

Housing must be molded in 1 piece, or fabricated from 2 or more pieces and joined into a single piece. Plastic must have ultraviolet stability, be unaffected by lamp heat, and be self-extinguishing. Housing and door must be colored throughout and be black, matching Color No. 17038, 27038, or 37038 of Federal Standard 595B.

Each face section must be joined to adjacent section by one of the following:

1. Minimum of 3 machine screws for 8-inch sections and 4 machine screws for 12-inch sections, installed through holes near front and back of housing. Each screw must be a No. 10 and have a nut, flat washer, and lock washer.
2. Two machine screws, each with a nut, flat washer, and lock washer, installed through holes near the front of the housing, and a fastening through the 1-1/2-inch pipe opening. Fastening must have 2 large flat washers to distribute the load around the pipe opening and 3 carriage bolts, each with a nut and lock washer. Minimum screw size must be No. 10. Minimum carriage bolt size must be 1/4 inch.

Supporting section of each signal face supported only at top or bottom must have reinforcement.

Reinforcement plate must be either sheet aluminum, galvanized steel, or cast aluminum. Each plate must be a minimum of 0.11-inch thick and have a hole concentric with 1-1/2-inch pipe-mounting hole in the housing. Place reinforcement plate as follows:

Reinforcement Plate Placement

Type of Reinforcement Plate	Placement
Sheet aluminum	Inside and outside of housing
Galvanized steel	Inside of housing
Cast aluminum	Outside of housing

Reinforcement plates placed outside of the housing must be finished to match signal housing color and be designed to allow proper serrated coupling between signal face and mounting hardware. Minimum of 3 No. 10 machine screws must be installed through holes in each plate and matching holes in the housing. Each screw must have a round or binder head, a nut, and lock washer.

If signal face is supported by a Type MAS side attachment slip-fitter inserted between 2 sections, place spacers between the 2 sections. Vertical dimension of spacers must allow proper seating of serrations between the slip-fitter and the 2 sections. In addition to the fastening through the large openings in housing, the 2 sections must join with at least 2 machine screws through holes near the front of housing and the spacers, and through matching holes in a reinforcing plate installed in housing. Machine screws must be No. 10 minimum size. Spacers must be made of same material as signal housing.

If reinforcing webs are used to connect back of housing to top, bottom, and sides, reinforcing plates are not required.

Holes for machine screws must be either cast or drilled during signal section manufacturing. Surround each hole with a 1/8-inch minimum width boss to allow contact between signal sections about axis of hole.

Each plastic signal section must have a plastic or metal visor. Plastic signal faces requiring backplates must have plastic backplates.

Serrated nylon washer must be inserted between each plastic signal section and metal mounting assembly. Each washer must be between 3/16- and 1/4-inch thick. Serrations must match those on signal section and mounting assembly.

86-4.01B Electrical Components

Conductors must be connected to a terminal block mounted inside, at the back of housing. Terminal block must have enough screw type terminals or NEMA type tab connectors to end all field and module or lamp conductors independently. Permanently identify terminal with field conductors attached or color code conductors to facilitate field wiring.

86-4.01C Visors

Include removable visor with each signal section. Comply with ITE publication ST-017B. Visors are classified by lens enclosure as full circle, tunnel or cap. Bottom opens for tunnel type and both, bottom and lower sides open for cap type. Visors must be tunnel type.

Visor must have a downward tilt between 3 and 7 degrees with a length of:

1. 9-1/2-inch minimum for nominal 12-inch round lenses
2. 7 inch for nominal 8-inch round lenses

Metal visor must be formed from 0.050-inch, minimum thickness, aluminum alloy sheet.

Plastic visor must be either formed from sheet plastic or assembled from one or more injection, rotational, or blow-molded plastic sections. Material must be of a black homogeneous color with lusterless finish. Sections must be joined using thermal, chemical, or ultrasonic bonding, or with aluminum rivets and washers permanently colored to match visor.

Secure each visor to its door and prevent removal or permanent deformation when wind load specified in California Test 605 for plastic visors or 666 for metal visors is applied to its side for 24 hours.

If directional louvers are used, fit louvers snuggly into full-circular signal visors. Outside cylinder must be constructed of 0.030-inch nominal thickness, or thicker, sheet steel and vanes must be constructed of 0.016-inch nominal thickness, or thicker, sheet steel, or the cylinder and vanes must be constructed of 5052-H32 aluminum alloy of equal thickness.

86-4.02 (BLANK)

86-4.03 (BLANK)

86-4.04 BACKPLATES

Background light must not be visible between backplate and signal face or between sections.

Plastic backplates must be either formed from sheet plastic or assembled from extruded, molded, or cast sections. Sections must be factory joined using one of the following:

1. Appropriate solvent cement
2. Aluminum rivets and washers painted or permanently colored to match backplate
3. No. 10 machine screws with washers, lock washers, and nuts, painted to match backplate

Backplate material must be of black homogeneous color with a lusterless finish. Secure each plastic backplate to the plastic signal face in a manner that prevents its removal or permanent deformation when the wind-load test is applied to either the front or back of signal face. Permanent deformation of any portion of backplate must not exceed 5 degrees forward or backward after wind loading is applied for 24 hours.

If plastic backplate requires field assembly, join with at least 4 No. 10 machine screws at each field-assembled joint. Each machine screw must have an integral or captive flat washer, a hexagonal head slotted for a standard screwdriver, and either a locking nut or a nut and lockwasher. Machine screws, nuts, and washers must be stainless steel or steel with a zinc or black-oxide finish.

If a metal backplate has 2 or more sections, fasten sections with rivets or aluminum bolts peened after assembly to avoid loosening.

Instead of the screws shown on the plans, you may use self-threading No. 10 steel screws to fasten plastic backplates to plastic signal face. Each screw must have an integral or captive flat washer, a hexagonal head slotted for a standard screwdriver, and is stainless steel or steel with a zinc or black-oxide finish.

86-4.05 PROGRAMMED VISIBILITY VEHICLE SIGNAL FACES

Programmed visibility signal face and its installation must comply with Section 86-4.01, "Vehicle Signal Faces," Section 86-4.04, "Backplates," and Section 86-4.08, "Signal Mounting Assemblies."

Each programmed visibility signal section must:

1. Have a nominal 12-inch diameter circular or arrow indication
2. Comply with ITE publication ST-017B for color and arrow configuration
3. Have a cap visor
4. Have an adjustable connection that provides incremental tilting from 0 to 10 degrees above or below horizontal while maintaining a common vertical axis through couplers and mountings

Terminal connection must allow external adjustment about the mounting axis in 5-degree increments.

Signal must be mountable with ordinary tools and capable of servicing without tools. Preset adjustment at 4 degrees below horizontal.

Visibility of each programmed visibility signal face must be capable of adjustment or programming, within the face. When programmed, each signal face's indication must be visible only in those areas or lanes to be controlled, except that during dusk and darkness a faint glow to each side is allowed.

You must program the head as recommended by the manufacturer.

86-4.06 PEDESTRIAN SIGNAL FACES

Message symbols for pedestrian signal faces must be white "WALKING PERSON" and Portland orange "UPRAISED HAND." Comply with ITE Standards: "Pedestrian Traffic Control Signal Indications" and California MUTCD. Each symbol's height must be at least 10 inches and width must be at least 6-1/2 inches.

Luminance of "UPRAISED HAND" symbol must be 1,100 foot-lamberts, minimum, and luminance of "WALKING PERSON" symbol must be 1,550 foot-lamberts, minimum, when tested as specified in California Test 606.

Uniformity ratio of an illuminated symbol must not exceed 4 to 1 between the highest luminance area and the lowest luminance area.

Luminance difference between a nonilluminated symbol and the background around the symbol must be less than 30 percent when viewed with the visor and front screen in place and at a low sun angle.

Each housing, including front screen, must have maximum overall dimensions of 18-1/2-inch width, 19-inch height, and 11-1/2-inch depth.

All new pedestrian signal faces installed at an intersection must be the same make and type.

86-4.06A Type A

Each Type A pedestrian signal face must include a housing, 1 LED pedestrian signal combo module and a front screen.

86-4.06B Front Screen

Front screen installation for each Type A signal must comply with one of the following:

1. Install, tilting downward, at an angle of 15±2 degrees out from the top, an aluminum honeycomb screen with 0.2-inch cells, 3/8-inch thick, or a plastic screen of 3/8-inch squares, 1/2-inch thick with wall thickness of 1/16-inch. Completely cover message plate. Include a clear front cover of 1/8-inch minimum thickness acrylic plastic sheet or 1/16-inch minimum thickness polycarbonate plastic. Hold screen and cover firmly in place with stainless steel or aluminum clips or stainless steel metal screws.
2. Install a 1-1/2-inch deep eggcrate or Z crate type screen of 1/32-inch nominal thickness polycarbonate. Mount screening in a frame constructed of 0.040-inch minimum thickness aluminum alloy or polycarbonate. Install screen parallel to face of message plate and hold in place with stainless steel screws.

The Department will test screens in a horizontal position with its edges supported. When a 3-inch diameter, 4-pound steel ball is dropped on the screen from a height of 4 feet above, the front screen must not fracture, separate at the welds, or compress more than 1/8-inch. When pedestrian housing is used to support front screen during test, remove message plate from pedestrian signal housing, so there is no back support for the screen.

Screen and frame must be one of the following:

1. Manufactured from aluminum anodized flat black
2. Finished with lusterless black exterior grade latex paint formulated for application to properly prepared metal surfaces
3. Manufactured from flat black plastic

86-4.06C Housing

Pedestrian signal housing must comply with Section 86-4.01A, "Signal Sections."

86-4.06D Finish

Paint exterior of each housing as specified in Section 86-2.16, "Painting."

86-4.06E Control

Pedestrian signals must be controllable by solid-state switching devices specified for traffic signal controller assemblies.

86-4.06F Terminal Blocks

Include light duty terminal block, as specified in Section 86-4.01B, "Electrical Components," with each pedestrian signal face.

86-4.07 (BLANK)

86-4.08 SIGNAL MOUNTING ASSEMBLIES

Signal mounting assembly must include:

1. 1-1/2-inch standard steel pipe or galvanized conduit
2. Pipe fitting made of ductile iron, galvanized steel, aluminum alloy Type AC-84B No. 380, or bronze
3. Mast arm and post top slip-fitters, and terminal compartments made of cast bronze or hot-dip galvanized ductile iron

After installation, clean and paint exposed threads of galvanized conduit brackets and bracket areas damaged by wrench or vise jaws. Use wire brush to clean and apply 2 coats of approved unthinned zinc-rich primer, organic vehicle type, as specified in Section 91, "Paint." Do not use aerosol can.

Fit each terminal compartment with a terminal block having a minimum of 12 positions, each with 2 screw-type terminals. Each terminal must accommodate at least five No. 14 conductors. Include a cover on compartment for ready access to terminal block. Terminal compartment used to bracket mount signals must be bolted securely to pole or standard.

Horizontal dimension of mounting assembly members between vertical centerline of terminal compartment or slip-fitter, and the vertical centerline of each signal face must not exceed 11 inches, except where required for proper signal face alignment or to allow programming of programmed visibility signal faces.

Mounting assembly members must be plumb or level, symmetrically arranged, and securely assembled.

Mounting assembly must be watertight, and free of sharp edges or protrusions that might damage conductor insulation. Include positive locking serrated fittings that, if mated with similar fittings on signal faces, will prevent faces from rotating.

Orient each mounting assembly to allow maximum horizontal clearance to adjacent roadway.

Use slip-fitter for post-top mounting of signals. Fit slip-fitter over a 4-1/2-inch outside diameter pipe or tapered standard end. Include cadmium-plated steel set screws. Include an integral terminal compartment for each slip-fitter used to post-top mount signals with brackets.

Do not install signal faces at an intersection until all other signal equipment, including complete controller assembly, is in place and ready for operation. You may mount signal faces if covered or not directed toward traffic.

86-4.09 FLASHING BEACONS

Flashing beacon must include:

1. Single section traffic signal face with yellow or red LED module indications
2. Backplate
3. Tunnel visor
4. Flashing beacon control assembly

Beacon flasher unit must be independent of intersection flasher unit.

86-4.09A Flashing Beacon Control Assembly

86-4.09A(1) Enclosure

Enclosure must be:

1. NEMA 3R with a dead front panel and a hasp with a 7/16-inch hole for a padlock
2. Powder coated, hot-dip galvanized, or factory-applied rust resistant prime coat and finish coat

86-4.09A(2) Circuit Breakers and Switches

Circuit breakers must comply with Section 86-2.11, "Service."

Switch for manually operating sign lighting circuit must be a single-hole-mounting toggle type with a single pole and throw and rated at 12 A, 120 V(ac). Furnish switch with an indicating nameplate reading "Auto-Test."

86-4.09A(3) Flasher

Comply with Section 8, "Solid-State Flashers," of NEMA Standards publication No. TS 1.

Flasher must be a solid-state device with no contact points or moving parts.

Include 2 output circuits to allow alternate flashing of signal faces. Flasher must be able to carry a minimum of 10 A per circuit at 120 V(ac).

86-4.09A(4) Wiring

Conductors and wiring in the enclosure must comply with Section 86-2.09B(1), "Cabinet and Enclosure Installation."

86-4.09A(5) Terminal Blocks

Terminal blocks must be:

1. Rated 25 A, 600 V(ac)
2. Molded phenolic or nylon material
3. Barrier type with plated brass screw terminals and integral marking strips

86-5 DETECTORS

86-5.01 VEHICLE DETECTORS

Sensor unit and isolator must comply with TEES.

86-5.01A Inductive Loop Detectors

86-5.01A(1) General

Inductive loop detector includes a completely installed loop or group of loops, in the roadway, lead-in cable, and a sensor unit, with power supply installed in a controller cabinet.

86-5.01A(2) (Blank)

86-5.01A(3) Construction Materials

Conductor for each inductive loop detector must be continuous, unspliced, and one of the following:

Conductor Options for Inductive Loop Detector

Option	Specifications
Type 1 loop wire	Type RHW-USE neoprene-jacketed or Type USE cross-linked polyethylene insulated, No. 12, stranded copper wire with a 40 mils minimum thickness at any point.
Type 2 loop wire	Type THWN or Type XHHW, No. 14, stranded copper wire in a plastic tubing. Plastic tubing must be polyethylene or vinyl, rated for use at 105 °C, and resistant to oil and gasoline. Outside diameter of tubing must be 0.27 inch maximum with a wall thickness of 0.028 inch minimum.

Conductor for loop detector lead-in cable must be two No. 16, 19 x 29, stranded, tinned copper wires, comply with the calculated cross sectional area of ASTM B 286, Table 1, and be one of the following:

Conductor Options for Loop Detector Lead-In Cable

Option	Specifications
Type B lead-in cable	Insulated with 20 mils of high-density polyethylene. Conductors must be twisted together with at least 2 turns per foot and the twisted pair must be protected with a copper or aluminum polyester shield. A No. 20, minimum, copper drain wire must be connected to equipment ground within cabinet. Cable must have a high-density polyethylene or high-density polypropylene outer jacket with a nominal thickness of 32 mils. Include an amorphous interior moisture penetration barrier of nonhydroscopic polyethylene or polypropylene fillers.
Type C lead-in cable	Comply with International Municipal Signal Association (IMSA) Specification No. 50-2. A No. 20, minimum, copper drain wire must be connected to equipment ground within cabinet.

86-5.01A(4) Installation Details

Install loop conductors without splices and end in nearest pull box. Seal open end of cable jacket or tubing similar to splicing requirements to prevent water from entering. Do not make final splices between loops and lead-in cable until loop operations under actual traffic conditions is approved.

Splice all loop conductors for each direction of travel for same phase of a traffic signal system, in same pull box, to a detector lead-in cable that runs from pull box adjacent to loop detector to a sensor unit mounted in controller cabinet.

End all loop conductors in a pull box or terminal strip in the cabinet.

Identify and band conductors for inductive loop installations. Band, in pairs, by lane, in the pull box adjacent to the loops and near the end of conductors in the cabinet. Bands must comply with Section 86-2.09, "Wiring."

If HMA surfacing is to be placed, install loop conductors before placing uppermost layer of HMA. Install conductors in compacted layer of HMA immediately below the uppermost layer. Install conductors as shown on the plans, except fill slot with sealant flush to the surface.

When cutting loops:

1. Residue from slot cutting activities must not be allowed to flow across shoulders or lanes occupied by public traffic and must be removed from the pavement surface before residue flows off. Dispose of residue from slot cutting activities under Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way."
2. Surplus sealant must be removed from adjacent road surface without using solvents before setting.

Sealant for filling slots must comply with one of the following:

Elastomeric Sealant

Polyurethane material that will, within stated shelf life, cure only in the presence of moisture. Sealant must be suitable for use in both HMA and PCC.

The cured sealant must have the following performance characteristics:

Performance Characteristics of Cured Sealant

Specification	ASTM	Requirement
Hardness (indentation) at 25 °C and 50% relative humidity. (Type A, Model 1700 only)	D 2240 Rex.	65-85
Tensile Strength: Pulled at 508 mm per minute	D 412 Die C	3.45 MPa, min.
Elongation: Pulled at 508 mm per minute	D 412 Die C	400%, min.
Flex at -40 °C: 0.6-mm free film bend (180°) over 13-mm mandrel	--	No cracks
Weathering Resistance: Weatherometer 350 h, cured 7 days at 25 °C @ 50% relative humidity	D 822	Slight chalking
Salt Spray Resistance: 28 days at 38 °C with 5% NaCl, Die C & pulled at 508 mm per minute	B 117	3.45 MPa, min. tensile 400%, min. elongation
Dielectric Constant over a temperature range of -30 °C to 50 °C	D 150	Less than 25% change

Asphaltic Emulsion Sealant

Comply with State Specification 8040-41A-15. Use for filling slots in HMA pavement that are a maximum of 5/8 inch in width. Do not use where the slope causes the material to run from the slot. Material must not be thinned beyond manufacturer's recommendations. Place material when air temperature is at least 7 °C.

Hot-Melt Rubberized Asphalt Sealant

Hot-melt rubberized asphalt must be:

1. In solid form at room temperature and fluid at application temperature of 190 °C to 205 °C. Fumes must be non-toxic.

2. Suitable for use in both HMA and PCC.
3. Melted in a jacketed, double-boiler type melting unit. Temperature of heat transfer medium must not exceed 245 °C.
4. Applied with a pressure feed applicator or pour pot, when the pavement surface temperature is greater than 4 °C.
5. Packaged in containers clearly marked "Detector Loop Sealant" and specifying manufacturer's batch and lot number.

The cured sealant must have the following performance characteristics:

Performance Characteristics of Cured Sealant

Specification	ASTM	Requirement
Cone Penetration, 25 °C, 150 g, 5 s	D 5329, Sec. 6	3.5 mm, max
Flow, 60 °C	D 5329, Sec. 8	5 mm, max
Resilience, 25 °C	D 5329, Sec. 12	25%, min
Softening Point	D 36	82 °C, min
Ductility, 25 °C, 50 mm/min	D 113	300 mm, min
Flash Point, COC, °C	D 92	288 °C, min
Viscosity, Brookfield Thermosel, No. 27 Spindle, 20 rpm, 190 °C	D 150	Less than 25% change

86-5.01B Magnetic Detectors

Cable from pull box, adjacent to magnetic detector sensing element, to the field terminals in the controller cabinet must be the type specified for inductive loop detectors.

86-5.02 PEDESTRIAN PUSH BUTTON ASSEMBLIES

Housing must be either die-cast or permanent mold-cast aluminum, or ultraviolet stabilized, self-extinguishing structural plastic, if specified. Plastic housing must be black matching Color No. 17038, 27038 or 37038 of Federal Standard 595B, and colored throughout. Assembly must be rainproof and shockproof in any weather condition.

Switch must be a single-pole, double-throw, switching unit, with screw type terminals, rated 15 A at 125 V(ac), and must have:

1. Plunger actuator and a U frame to allow recessed mounting in push button housing
2. Operating force of 3.5 pounds
3. 1/64-inch maximum pretravel
4. 7/32-inch minimum overtravel
5. 0.0004- to 0.002-inch differential travel
6. 2-inch minimum diameter actuator

Where pedestrian push button is attached to a pole, shape housing to fit the pole curvature and secure. Include saddles to make a neat fit if needed.

Where a pedestrian push button is mounted on top of a 2-1/2-inch diameter post, fit housing with a slip-fitter and use screws for securing rigidly to post.

Pedestrian push button signs must be porcelain enameled metal or structural plastic.

Install push button and sign on crosswalk side of pole.

Point arrows on push button signs in the same direction as the corresponding crosswalk.

Attach sign on Type B push button assembly.

For Type C pedestrian push button assembly, mount instruction sign on the same standard as the push button assembly, using 2 straps and saddle brackets. Straps and saddle brackets must be corrosion-resisting chromium nickel steel and comply with ASTM A 167, Type 302B. Theft-proof bolts must be stainless steel with a chromium content of at least 17 percent and a nickel content of at least 8 percent.

86-6 LIGHTING

86-6.01 HIGH PRESSURE SODIUM LUMINAIRES

High pressure sodium luminaires must be the enclosed cutoff type.

Housing must be manufactured from aluminum. Painted or powder-coated housing must withstand a 1,000-hour salt spray test as specified in ASTM B 117.

Other metal parts must be corrosion resistant.

Each housing must include a slip-fitter that can be mounted on a 2-inch pipe tenon and can be adjusted 5 degrees from the axis of the tenon. Clamping brackets of slip-fitter must not bottom out on housing bosses when adjusted within the ±5 degree range.

The slip-fitter mounting bracket must not permanently set in excess of 0.020-inch when the 3/8-inch diameter cap screw used for mounting is tightened to 10 foot-pounds.

Luminaire to be mounted horizontally on mast arm, when tested as specified in California Test 611, must be capable of withstanding cyclic loading for a minimum of 2 million cycles without failure of any luminaire parts as follows:

Cyclic Loading

Plane	Internal Ballast	Minimum Peak Acceleration Level[a]
Vertical	Removed	3.0 G peak-to-peak sinusoidal loading (same as 1.5 G peak)
Horizontal[b]	Installed	1.5 G peak-to-peak sinusoidal loading (same as 0.75 G peak)
Vertical	Installed	1.0 G peak-to-peak sinusoidal loading (same as 0.5 G peak)

[a]G = Acceleration of gravity

[b]Perpendicular to direction of mast arm

If a photoelectric unit receptacle is included, a raintight shorting cap must be installed. If luminaire housing has a hole for the receptacle, hole must be permanently closed, covered, and sealed with weatherproof material.

Optical system must be in a sealed chamber and include:

1. Reflector shaped so that a minimum of light is reflected through the arc tube of the lamp. Reflector surface must be specular and protected by either an anodized finish or a silicate film on its specular surface.
2. Refractor or lens mounted in a door frame that is hinged to the housing and secured with a spring-loaded latch. Refractor must be made of glass or polycarbonate plastic. Lens must be made of heat- and impact-resistant glass.
3. Lamp socket that is a porcelain enclosed mogul-multiple type. Shell must include integral lamp grips to assure electrical contact under conditions of normal vibration. Socket must be mounted in the luminaire to allow presetting a variety of specified light distribution patterns. Socket must be rated for 1,500 W and 600 V(ac), and a 4 kV pulse.
4. Lamp.

Sealing must be provided by a gasket between the reflector and:

1. Refractor or lens
2. Lamp socket

Chamber must allow for filtered flow of air in and out of the chamber from lamp heat. Filtering must be accomplished by either a separate filter or a filtering gasket.

If components are mounted on a down-opening door, door must be hinged and secured to luminaire housing separately from refractor or flat lens frame. Door must be easily removable and replaceable, and secured to housing to prevent accidental opening when refractor or flat lens frame is opened.

Field wires connected to luminaire must terminate on a barrier-type terminal block secured to the housing. Terminal screws must be captive and equipped with wire grips for conductors up to No. 6. Each terminal positions must be clearly identified.

Minimum light distribution for each luminaire must meet the isolux diagrams.

Maximum brightness of each cutoff luminaire, with the lamp indicated, must be as follows:

Cutoff Type

Lamp ANSI Code No.	Lamp Wattage	Maximum Brightness foot-lamberts
S55	150	40
S66	200	40
S50	250	50
S67	310	60
S51	400	75

Brightness readings will be taken using a brightness meter with an acceptance angle of 1.5 degrees. When measured on the 90-degree and 270-degree lateral angle line, maximum brightness must not exceed above specified brightness when meter is located at a horizontal distance of 120 feet and a vertical distance of 7.5 feet between luminaire and meter, or at an angle of 3 degrees 35 minutes from the horizontal to the line between luminaire and meter. Measurements must be made from 90-degree line and 270-degree line, and averaged. Lamp used for each test must operate at wattage necessary to produce the following light output:

Light Output

Lamp Wattage	Lumens
150	16,000
200	22,000
250	27,000
310	37,000
400	50,000

86-6.01A High Pressure Sodium Lamp Ballasts

Each ballast must:

1. Operate the lamp for its rated characteristics and wattage
2. Continuously operate at ambient air temperatures from -20 °C to 25 °C without reduction in ballast life
3. Operate for at least 180 cycles of 12 hours on and 12 hours off, with the lamp circuit in an open or short-circuited condition and without measurable reduction in operating requirements
4. Have a design life of not less than 60,000 hours
5. Provide proper starting and operating waveforms, voltage, and current
6. Provide reliable lamp starting and operation at ambient temperature down to -20 °C for the rated life of lamp

Ballast must be tested as specified in ANSI C82.6-1980, "Methods of Measurement of High-Intensity-Discharge Lamp Ballasts."

Starting aids for ballast of a given lamp wattage must be interchangeable between ballasts of same wattage and manufacturer, without adjustment.

Each integral ballast must consist of separate components that can be easily replaced. An encapsulated starting aid will be counted as a single component. Each component must include screw terminals, NEMA tab connectors, or a single multi-circuit connector. Conductors and terminals must be identified.

Mount heat-generating component so as to use the portion of the luminaire it is mounted to as a heat sink. Place capacitor a maximum practicable distance from heat-generating components or thermally shield to limit the case temperature to 75 °C.

Transformer and inductor must be resin-impregnated for protection against moisture. Capacitors, except those in starting aids, must be metal cased and hermetically sealed.

The Department will test high-pressure sodium lamp ballast. High-pressure sodium lamp ballast must have a characteristic curve that will intersect both of the lamp-voltage limit lines between the wattage limit lines and remain between the wattage limit lines throughout the full range of lamp voltage. This requirement must be met at the rated input voltage of the ballast and at the lowest and highest rated input voltage of the ballast.

Throughout the lifetime of the lamp, ballast curve must fall within the specified limits of the lamp voltage and wattage.

Ballast for luminaires must be located in the luminaire housing.

86-6.01A(1) Regulator Type Ballasts

Regulator type ballast must comply with the following:

1. For nominal input voltage and lamp voltage, ballast design center must not vary more than 7.5 percent from rated lamp wattage.
2. Ballast must be designed for a capacitance variance of ±6 percent that will not cause more than ±8 percent variation in lamp wattage regulation during rated lamp life.
3. Lamp current crest factor must not exceed 1.8 for input voltage variation of ±10 percent at any lamp voltage during lamp life.

Regulator-type ballast must be one of the following:

Regulator-Type Ballast

Ballast Type	Power Factor	Lamp Regulation
Lag-type[a]	Not less than 90 percent throughout the life of lamp when ballast is operated at nominal line voltage with a nominally-rated reference lamp	Lamp wattage regulation spread does not vary by more than 18 percent for ±10 percent input voltage variation from nominal through life
Lead-type[b]	Not less than 90 percent throughout the life of lamp when ballast is operated at nominal line voltage with a nominally-rated reference lamp	Lamp wattage regulation spread does not vary by more than 30 percent for ±10 percent input voltage variation from nominal through life

[a]Primary and secondary windings must be electrically isolated
[b]Constant wattage autoregulator (CWA)

86-6.01A(2) Nonregulator Type Ballasts

Each nonregulator type ballast must comply with the following:

1. For nominal input voltage and lamp voltage, ballast design center must not vary more than 7.5 percent from rated lamp wattage.
2. Lamp current crest factor must not exceed 1.8 for input voltage variation of ±5 percent at any lamp voltage during lamp life.

Nonregulator-Type Ballast

Ballast Type	Power Factor	Lamp Regulation
Autotransformer or High-Reactance	Not less than 90 percent throughout the life of lamp when ballast is operated at nominal line voltage with a nominally-rated reference lamp	Lamp wattage regulation spread does not vary by more than 25 percent for ±5 percent input voltage variation from nominal through life

86-6.01B High Pressure Sodium Lamps

High pressure sodium lamps must comply with ANSI C 78.42, "High Pressure Sodium Lamps," when tested as specified in ANSI C 78.389, "American National Standard for Electric Lamps - High Intensity Discharge-Methods of Measuring Characteristics." High pressure sodium lamps must have a minimum average rated life of 24,000 hours.

86-6.02 LOW PRESSURE SODIUM LUMINAIRES

Each low pressure sodium luminaire must be completely assembled with a lamp and ballast, and must:

1. Be the enclosed type, either semi-cutoff or cutoff type.
2. Include housing, reflector, refractor or lens, lamp socket, integral ballast, removable ballast tray, lamp support, terminal strip, capacitor, and slip fitter. Reflector may be an integral part of the housing.

Luminaire housing must be minimum 1/16-inch thick, corrosion resistant die cast aluminum sheet and plate with concealed continuous welds, or minimum nominal wall thickness of 3/32-thick acrylonitrile-butadiene-styrene sheet material, on a cast aluminum frame that provides mounting for all electrical components and slip fitter.

Housing must be divided into optical and power compartments that are individually accessible for service and maintenance. Position and clamp luminaire to pipe tenon by tightening mounting bolts.

Painted exterior surface of luminaire must be finished with a fused coating of electrostatically applied polyester powder paint or other ultraviolet inhibiting film. Color must be aluminum gray.

High temperature neoprene, or equal, sealing ring must be installed in pipe tenon opening to prevent entry of water and insects into power and optical compartments.

Access to power unit assembly must be through a weathertight hinged cover, secured with spring type latches or captive screws, to luminaire housing.

Hardware must be stainless steel or cadmium plated. Use machine screws or bolts to secure removable components. Do not use sheet metal screws.

Semi-cutoff luminaires and molded refractor style cutoff luminaires must include a refractor. Other cutoff luminaires must include a flat lens.

Refractor must be 1-piece injection molded polycarbonate of 3/32 inch minimum thickness, or 1-piece injection molded acrylic of 1/8 inch minimum thickness. Flat lens must be 1-piece polycarbonate of 3/32 inch minimum thickness, mounted to metal frame. Refractor assembly and flat lens assembly must be constructed to rigidly maintain its shape, and hinged and secured with spring type latches to luminaire housing. Alternate methods of manufacturing refractor may be approved provided minimum specified thicknesses are maintained.

Lamp socket must be high temperature, flame retardant thermoset material with self-wiping contacts or equivalent. Socket must be rated for 660 W and 1,000 V(ac). Position of socket and support must maintain the lamp in correct relationship with reflector and refractor for designed distribution pattern.

Isofootcandle distribution must be ANSI Type III, short or Type IV, medium distribution, for cutoff or semi-cutoff luminaires.

With a 40-foot mounting height, each type of luminaire must maintain a minimum of 0.2 footcandle at least 60 feet each side, along the longitudinal roadway line below the luminaire, and a minimum of 0.35 footcandle at a transverse roadway distance from luminaire location equal to 1.5 times the luminaire mounting height.

Certified luminaire performance data must be provided. This data must include complete photometric test data in isofootcandle charts at a scale of 1 inch equals 20 feet, for the luminaire and lamp sizes shown on the plans.

Alternate data may be in horizontal footcandle values recorded on a 15' x 15' area extending 90 feet longitudinally each side of the light source, and 15 feet behind and 90 feet in front of the light source, for luminaire and lamp sizes, and mounting height shown on the plans. Horizontal footcandle levels in data submitted must equal or exceed levels specified. Failure to meet referenced values will be justification for rejection of the luminaires.

Photometric testing must be performed and certified by an independent and recognized testing laboratory.

Low pressure sodium lamps must:

1. Be 180 W, single-ended, bayonet base, tubular gas discharge lamp
2. Maintain a minimum of 93 percent of initial lumens during rated life and must comply with the following minimum performance requirements:

Performance Requirements

Lamp Designation	ANSI L74-RF-180
Initial Lumens	33,000 lumens
Rated Ave. Life (@ 10 hrs/Start)	18,000 hours
Operating Position	Horizontal ±20 degrees

3. Reach 80 percent of light output within 10 minutes and must restrike within 1 minute after an outage due to power interruption or voltage drop at the lamp socket
4. Identify the month and year of installation.
5. Have an autotransformer or high-reactance type ballast. The ballast must comply with the following:

    5.1. Lamp current crest factor must not exceed 1.8 at nominal line voltage
    5.2. Ballast loss must not exceed 24 percent for 180 W ballast at nominal line voltage

Autotransformer or High-Reactance Type Ballast

Ballast Type	Power Factor	Lamp Operation
Autotransformer or High-Reactance	Not less than 90 percent when ballast is operated at nominal line voltage with a nominally-rated reference lamp	Lamp wattage regulation spread does not vary by more than ±6 percent for ±10 percent input voltage variation from nominal through life

A multi-circuit connector must be included for quick disconnection of ballast tray.

86-6.03 SOFFIT AND WALL LUMINAIRES

Soffit and wall luminaire must be weatherproof and corrosion resistant.
Each flush-mounted soffit luminaire must consist of:

1. Metal body with two 1-inch minimum conduit hubs and provisions for anchoring into concrete
2. Prismatic refractor made of heat-resistant polycarbonate mounted in a door frame and clearly identified as to street side
3. Specular anodized aluminum reflector
4. Ballast located either within housing or in a ceiling pull box as shown on the plans
5. Lamp socket

The door frame assembly must be hinged, gasketed, and secured to body by at least 3 machine screws.
Each pendant soffit luminaire must be enclosed and gasketed, have an aluminum finish, and include:

1. Reflector with a specular anodized aluminum finish
2. Refractor made of heat-resistant polycarbonate
3. Optical assembly hinged and latched for lamp access and a device to prevent dropping
4. Ballast designed for operation in a raintight enclosure
5. Galvanized metal box with a gasketed cover, 2 captive screws, and 2 chains to prevent dropping and for luminaire mounting

Each wall-mounted luminaire must consist of:

1. Cast metal body
2. Prismatic refractor, made of glass, mounted in a door frame
3. Aluminum reflector with a specular anodized finish
4. Integral ballast
5. Lamp socket
6. Gasket between refractor and body
7. At least two 5/16-inch minimum diameter mounting bolts

Cast-aluminum bodies to be cast into or mounted against concrete must have a thick application of alkali-resistant bituminous paint on all surfaces to be in contact with concrete.

Each soffit luminaire and wall luminaire must include a 70 W high-pressure sodium lamp with a minimum average rated life of 24,000 hours. Each lamp socket must be positioned to locate the light center of the lamp within 1/2 inch of light center location of the luminaire design.

Ballast must comply with Section 86-6.01A, "High Pressure Sodium Lamp Ballasts." Wall luminaire ballast must be located in luminaire housing or, if shown on the plans, in a pull box adjacent to luminaire.

86-6.04 PEDESTRIAN CROSSING FIXTURES

Before starting fixture manufacturing, submit fixture design for approval. If requested, submit 1 complete prototype fixture for approval at least 30 days before manufacturing the fixtures. The prototype fixture will be returned to you, and if permitted, the fixture may be installed in the work.

Lens unit in door section must be formed of 1-1/2-inch methyl methacrylate rod cut and fire-glazed for a clear finish or a cast unit with equivalent tolerances and finish.

Lens must be secured to door section with an extruded lens retainer of 6063-T5 aluminum alloy that fits the lens shape. Lens retainer must fit the full length of lens on both sides. Continuous lens retainer for the full length of 3 lenses is allowed. Z bars of 5052-H32 or 5005-H14 aluminum alloy, 1/16 inch minimum thickness may be substituted for extruded lens retainer.

A captive positive-keyed screw-type latching device requiring a special socket wrench must be installed at upper edge to secure door in the closed position as shown on the plans. Furnish 2 special wrenches to the Engineer.

Each fixture must include a F48T12/CW rapid start fluorescent lamp with recessed, double contact base installed on back side of door directly behind lens.

Each lampholder must be UL listed for outdoor use without an enclosure and with 1,500 mA rapid start fluorescent lamp. Lampholder must be spring-loaded type.

For each lamp, the distance from face of lampholder to the lamp must be designed to provide a compression of at least 0.10-inch on the spring-type lampholder when lamp is in place. Lamp must have positive mechanical and electrical contact when lamp is in place. Socket on spring-type lampholder must have enough travel to allow lamp installation. Spring must not be a part of current-carrying circuit.

Ballast must be high-power-factor type with weatherproof leads for operation of one 48-inch rapid-start lamp. Ballast must be UL listed for outdoor operation on 110 to 125 V(ac) 60 Hz circuit and rated at 1,500 mA.

Conductors from ballast leads to lampholder must be minimum size of No. 16, stranded, and UL-listed copper AWM. Splicing of lampholder conductors to ballast leads must be performed by using mechanically secure connectors.

Conductors in fixture except ballast leads and entrance line conductors, must be UL-listed AWM.

Provide sufficient slack in the conductors to allow the fixture door to fully open.

Circuit conductors entering the fixture must be terminated on molded phenolic barrier-type terminal blocks rated at 15 A and 600 V(ac) and must have integral-type white waterproof-marking strips. Current-carrying parts of terminal blocks must be insulated from fixture with integral plugs or strips to provide protection from line-to-ground flashover voltage. Terminal blocks must be attached to wireway cover in top section. If you use sectionalized terminal blocks, each section must include an integral barrier on each side and be capable of rigid mounting and alignment.

Exposed surfaces of fixture must be uniform in appearance and free from significant defects, including improper fit, dents, deep scratches and abrasions, burrs, roughness, off-square ends, holes off-center or jagged, and surface irregularities. Screws for attaching components to fixture door, including Z bars, ballasts, and terminal block, must be tapped into door from the inside only. Screwheads, nuts, or other fasteners must not be removable from the outside.

86-6.04A Pedestrian Undercrossing Fixtures

Fixture shell must be cast aluminum alloy, industrial type or Federal Class 18 aluminum of 1/4 inch minimum thickness.

Door must be 1 piece of 6061-T6 aluminum alloy of 1/8 inch minimum thickness.

Continuous piano hinge must be Type 1100 aluminum alloy. The piano hinge must be welded or riveted to door section with 1/8 inch aluminum rivets. Matching holes must be drilled in the hinge and lower edge of fixture. After shell is in place, door assembly must be attached by minimum 3/8-inch No. 8 stainless steel self-tapping screws.

A neoprene gasket must be attached to frame to provide a cushion between the shell and the door.

Chain or other device must be included to prevent the door, when fully opened, from coming in contact with the undercrossing wall.

Fixture must be held in place by three 3/8" x 8" anchor bolts with 2 nuts each.

Fixture surfaces in contact with concrete, and with anchor bolts and nuts must be painted with a thick application of alkali-resistant bituminous paint. Paint must comply with MIL-P-6883.

Circuit conductor entering the fixture must be terminated on 2-position terminal blocks.

Both ends of fixture must have holes for 1-inch conduit. Unused holes must be plugged with pressed metal closures.

86-6.04B Pedestrian Overcrossing Fixtures

Fixture shell must consist of:

1. Top section and a door section of extruded 6063-T5 aluminum alloy, each with a nominal 1/8 inch wall thickness
2. 2 cast-end sections of 319 aluminum alloy
3. Internal wireway cover of 505-H32 aluminum alloy

Top section and door section must be joined together on one side by a continuous hinge formed as part of the 2 extrusions and must overlay to allow locking on the other side. Hinge must be treated with a silicone grease that will prevent the entrance of water by capillary action.

Wireway cover with 3/16 inch hemmed ends up and terminal blocks and circuit conductors must be inserted before welding end sections and must provide clearance at both ends for conductors. Cover must be fastened by at least two 1/4 inch No. 4 self-threading sheet metal screws with binding head and blunt point. You may substitute blind rivets of equivalent strength.

One or more bronze sash chains or other device must be included to prevent door from opening to an extent that will damage the hinge.

Lampholder must include heat-resistant circular cross section neoprene sealing gasket, silver-coated contacts, and waterproofed lead entrance for use with a 1,500 mA rapid start fluorescent lamp.

Ballast must be at most 13-1/4 inches long.

Circuit conductors entering the fixture must be terminated on 3-position terminal blocks.

Electrical system of pedestrian overcrossing must be grounded by a No. 8 copper wire installed in conduit from fixture to fixture, from end fixture to conduit fitting on end post and from conduit fitting on end post to grounding bushing in nearest pull box.

Ground wire must be secured to inside of telescoping sleeve end casting where conductors are carried and to the inside of Type LB conduit fitting on end post by a connecting lug and a No. 8 self-threading pan screw.

Lamp, lampholder, ballast, and fixture wire, must be attached to door section. Terminal blocks must be attached to top section or wireway cover.

Three No. 10, solid copper circuit conductors must be installed between terminal blocks as part of each completed fixture.

Before shipment to job site, fixture must be completely manufactured and assembled in the shop.

86-6.05 INDUCTION SIGN LIGHTING FIXTURES

Each induction sign lighting fixture must include housing with door, reflector, refractor or lens, lamp, power coupler, high frequency generator, socket assembly, fuse block, and fuses.

Each induction sign lighting fixture must:

1. Be designed for mounting near the bottom of sign panel on an overhead sign structure.
2. Be an enclosed design and be raintight and corrosion resistant.
3. Have a minimum average rating of 60,000 hours.
4. Be for a wattage of 87 W, 120/240 V(ac).
5. Have a power factor greater than 90 percent and total harmonic distortion less than 10 percent.
6. Be UL approved for wet locations and be FCC Class A-listed.
7. Not exceed 44 pounds in weight.
8. Include the manufacturer's brand name, trademark, model number, serial number, and date of manufacture on packaged assembly. Same information must be permanently marked on the outside and inside of housing.
9. Comply with minimum horizontal footcandle requirement shown on the plans.
10. Be a maximum height of 12 inches above the top of the mounting rails.

If fixture is located so that the light center of the lamp is 55 inches in front of, 1 foot below, and centered on a 10-foot high by 20-foot wide sign panel, the ratio of maximum to minimum illuminance level on the panel must not exceed 12 to 1 in 95 percent of the points measured. Illuminance gradient must not exceed 2 to 1 and is defined as the ratio of minimum illuminance on a 1-foot square of panel to that on an adjacent 1-foot square of panel.

Each fixture must have a mounting assembly that will allow fixture to be mounted on continuous slot channels. Mounting assembly must be either cast aluminum, hot-dip galvanized steel plate, or steel plate that has been galvanized and finished with a polymeric coating system or same finish that is used for housing.

Housing must have a door designed to hold a refractor or lens, and to open without the use of special tools. Housing and door must be manufactured of sheet or cast aluminum, and have a powder coat or polyester paint finish of a gray color resembling unfinished manufacturing. Sheet aluminum must comply with ASTM B 209 or B 209M for 5052-H32 aluminum sheet. External bolts, screws, hinges, hinge pins, and door closure devices must be corrosion resistant.

Housing must include weep holes.

Door must be hinged to housing on side of fixture away from the sign panel and include 2 captive latch bolts or other latching device. Door must be designed to lock in the open position, 50 degrees minimum from the plane of the door opening, with an 85-mph 3-second-wind-gust load striking the door from either side.

Door and housing must be gasketed to be raintight and dusttight. Thickness of gasket must be 1/4 inch, minimum.

Fixture height must be less than 12 inches above the top of mounting rails.

Reflector must be 1 piece, made from specularly finished aluminum protected with an electrochemically applied anodized finish or a chemically applied silicate film, and designed so deposited water due to condensation will drain away. Reflector must be secured to housing with a minimum of 2 screws and removable without removing any fixture parts. Do not attach reflectors to outside of housing.

Refractor or lens must have a smooth exterior and must be manufactured from the material as follows:

Refractor and Lens Material Requirements

Component	Manufactured From
Flat lens	Heat-resistant glass
Convex lens	Heat resistant, high-impact resistant tempered glass
Refractor	Borosilicate heat resistant glass

Refractor and convex lens must be designed or shielded so no fixture luminance is visible if fixture is approached directly from the rear and viewing level is the bottom of the fixture. If a shield is used, it must be an integral part of the door casting.

Each fixture must include an 85 W induction lamp with an interior wall that is fluorescent phosphor-coated. Light output must be at least 70 percent at 60,000 hours. Lamp must have a minimum color-rendering index of 80, be rated at a color temperature of 4,000K and be removable without the use of tools.

Lamp socket must be a porcelain enclosed mogul type with a shell that contains integral lamp grips to assure electrical contact under normal vibration conditions. Center contact must be spring-loaded. Shell and center contact must be nickel-plated brass. Socket must be rated for 1,500 W and 600 V(ac).

Power coupler must include a construction base with antenna, heat sink, and electrical connection cable, and be designed so it can be removed with common hand tools.

High frequency generator must:

1. Start and operate lamps at an ambient temperature of -25 °C or greater for the rated life of the lamp
2. Operate continuously at ambient air temperatures from -25 °C to 25 °C without reduction in generator life
3. Have a design life of at least 100,000 hours at 55 °C
4. Have an output frequency of 2.65 MHz ± 10 percent
5. Have radio frequency interference that complies with FCC Title 47, Part 18, regulations regarding harmful interference
6. Be replaceable with common hand tools
7. Mounted so the fixture can be used as a heat sink

Conductor terminal must be identified by the component terminal the conductor connects to.

Submit a copy of the high frequency generator test methods and results from the manufacturer with each lot of fixtures.

Each fixture must include a barrier-type fuse block for terminating field connections. Fuse block must:

1. Be secured to housing and be accessible without removal of any fixture parts
2. Be mounted to leave a minimum of 1/2 inch air space from sidewalls of housing
3. Be designed for easy removal of fuses with a fuse puller, be rated at 600 V(ac), and have box terminals.

Fuses must be 13/32-inch diameter, 1-1/2 inch long ferrule type and UL or NRTL listed. For 120 V(ac) input fixture, only the ungrounded conductor must be fused and there must be a solid link between the neutral and the high frequency generator.

If shown on the plans, include a wire guard to prevent damage to the refractor or lens. Guard must be constructed of 1/4-inch minimum diameter galvanized steel wire, and either hot-dip galvanized or electroplated-zinc coated as specified in ASTM B 633, Service Condition SC4 with a clear chromate dip treatment. Guard elements must be spaced to prevent rocks larger than 1-1/2-inch diameter from passing through.

86-6.06 SIGN LIGHTING FIXTURES FOR FLASHING BEACON

Sign lighting fixture must:

1. Be UL or NRTL listed for outdoor installation

2. Include a hood with side outlet tapped for conduit, a symmetrical 10-inch steel reflector with a white porcelain-enamel finish, and a medium base socket
3. Be rated at 150 W minimum

86-6.07 INTERNALLY ILLUMINATED STREET NAME SIGNS

Sign fixture must be:

1. Designed and constructed to prevent deformation or failure when subjected to an 85 mph 3-second-wind-gust load as specified in AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaires and Traffic Signals," and its interim revisions
2. Manufactured from all new material and all ferrous parts must be galvanized or cadmium-plated
3. Type A or B signs

Top and bottom must be formed or extruded aluminum and must be attached to formed or cast aluminum end fittings. Housing must be designed for continuous sealing between top and bottom assemblies, and end fittings, and be constructed to resist torsional twist and warp. Opening or removing 1 panel must allow access to the interior of the sign for lamp, ballast, and fuse replacement.

Photoelectric unit sockets are not allowed.

For Type A sign, both sides must be hinged at the top to allow installation or removal of sign panel, and to allow access to interior of sign.

For Type B sign, sign panel must be slide-mounted into housing.

Reflectors may be used to obtain required sign brightness. Reflectors must be formed aluminum with acrylic baked white enamel surface having a minimum reflectance of 0.85.

Sign panel must be slide-mounted or rigid-mounted in a frame, with white legend, symbols, arrows, and border on each face. Background must be green.

Sign panels surface must be evenly illuminated. Average of brightness readings for letters must be 150 foot-lamberts, minimum. Light transmission factor of sign panel must provide a letter to background brightness ratio between 10 to 1 and 20 to 1. Background luminance must not vary by more than 40 percent from the average background brightness reading. Luminance of letters, symbols, and arrows must not vary by more than 20 percent from their average brightness readings.

Sign panels must be translucent, high impact, resistant plastic panels of one of the following:

1. Glass fiber reinforced acrylated resin
2. Polycarbonate resin
3. Cellulose acetate butyrate plastic

Paint on the outside of plastic must be protected by a plastic film that seals the front surface of panel and filters out ultraviolet radiation. Paint must be acrylic plastic type.

Surface must be free of blemishes in the plastic or coating that may impair the serviceability or detract from the general appearance and color matching of sign.

White or green color must not fade or darken when sign is exposed to an accelerated test of ultraviolet light equivalent to 2 years of outdoor exposure. Green color of sign, when not illuminated, must match Color No. 14109 of Federal Standard 595B.

Sign panel must not crack or shatter when a 1-inch diameter, steel ball with a weight of 2.4 ounces is dropped from a height of 8.5 feet above the sign panel to any point of sign panel. For this test, sign panel must be lying in a horizontal position and supported within its frame.

For Type A sign, gasket must be installed between sign panel frame and fixture housing to prevent water entry between frame and fixture housing. Gasket must be uniform and even-textured, and be the closed-cell, sponge-neoprene type, designed for use at temperatures between -20 °C and +74 °C.

Gasket must be neatly applied to thoroughly degreased, clean surface with a suitable heat-resistant adhesive that will not allow the gasket to slip at temperatures between -20 °C and +74 °C.

Ballast must be high power factor type and capable of starting the lamp at -20 °C and above.

Ballast for Type A sign must be rated at 200 mA. Ballasts for Type B sign must be rated at 430 mA. Ballast must be UL or NRTL listed for operation on 110 to 125 V(ac), 60 Hz circuits, and comply with ANSI C 82.1 and ANSI C 82.2.

Lampholder must be UL or NRTL listed for outdoor use and of the spring-loaded type. Lampholder must have silver-coated contacts and waterproofed entrance leads for use with a rapid-start fluorescent lamp. Removal of lamp from socket must de-energize the primary of ballast. Each lampholder must include heat-resistant, circular cross

section, partially-recessed neoprene ring to seal against lamp ends and protect electrical contacts from moisture, dirt or other injurious elements.

Distance between face of lampholders must be designed to provide compression of at least 0.10 inch on the spring-type lampholder when lamp is in place. Lamp must have positive mechanical and electrical contact when lamp is in place. Socket on spring-type lampholder must have sufficient travel to allow lamp installation. Spring must not be a part of current carrying circuit. Lampholder must match lamp requirements and must not increase cathode filament circuit resistance by more than 0.10 Ω.

Lamp must comply with ANSI C 78.

Wiring connections in fixture must be terminated on molded, phenolic, barrier-type, terminal blocks rated at 15 A, 1,000 V(ac), and must have integral-type white waterproof-marking strips. Current carrying parts of terminal blocks must be insulated from fixture with integral plugs or strips to provide protection from line-to-ground flashover voltage. If you choose to use sectionalized terminal blocks, each section must include an integral barrier on each side and be capable of rigid mounting and alignment. Terminal screws must be No. 10, minimum.

Fuses must be Type 3AG, miniature, slow-blowing type with appropriate current and voltage ratings.

Fuseholder must be a panel-mounting type with threaded or bayonet-type knob that grips the fuse tightly for extraction. Use a separate fuse for each ballast.

Screened weep holes must be constructed at strategic locations in members subject to moisture collection.

Fasteners, screws, and hardware must be passive stainless steel, Type 302 or 304, or aluminum Type 6060-T6.

Top of fixture housing must have 2 free-swinging mounting brackets. Each bracket must be adjustable vertically for leveling the sign to either a straight or curved mast arm. Bracket assembly must allow fixture to swing perpendicular to the sign panel.

Hinge pins for the free-swinging brackets must have a minimum diameter of 1/4 inch.

Message, as shown on the plans, must be displayed on both sign panels.

If not shown on the plans, the message and the size of symbols or arrows will be given by the Engineer at your request. Letters must be 8-inch upper case and 6-inch lower case, Series E.

Fixture conductors must be UL- or NRTL-listed AWM stranded copper wire with 28 mils, minimum, thermoplastic insulation, rated at 1,000 V(ac) and rated for use at 90 °C. Conductors must be No. 16 minimum and must match color coding of ballast leads.

Conductors within the fixture must be secured with easily removable spring cross straps, not clamped, in the chassis or fixture. Straps must be installed 12 inches apart or less.

Stranded copper conductors connected to screw-type terminals must terminate in approved crimp-type ring connectors.

Splices are not allowed within fixture.

Submit shop drawings showing the message for each sign, including size of letters, symbols or arrows, as shown on the plans. If requested, you must supply, without cost to the State, sufficient samples of materials to be used in the manufacturing of the sign or a complete sign assembly, to allow adequate testing and evaluation of compliance to specified requirements.

86-6.08 PHOTOELECTRIC CONTROLS

Photoelectric controls must be capable of directly switching multiple lighting systems.

86-6.08A Types

Photoelectric control type must comply with the following:

Photoelectric Control Types

Type I	Includes a remote photoelectric unit and a test switch housed in an enclosure.
Type II	Includes a remote photoelectric unit, a separate contactor located in a service equipment enclosure, and a test switch located in service equipment enclosure.
Type III	Includes a remote photoelectric unit, a separate contactor, and a test switch housed in an enclosure.
Type IV	Includes a photoelectric unit that plugs into an EEI-NEMA twist-lock receptacle integral with the luminaire.
Type V	Includes a photoelectric unit, contactor, and test switch located in service equipment enclosure.

A switch to allow manual operation of lighting circuit must be included for each Type I, Type II, Type III, and Type V photoelectric control. Switches must be single-hole mounting toggle type, single-pole, single-throw, rated at 12 A with a voltage rating that matches the circuit. Switches must have an indicating nameplate reading "Auto-

Test" and be connected in parallel with the load contacts of the photoelectric unit. Test switches must not have an "OFF" position.

Photoelectric unit for Types I, II, and III photoelectric controls, must be pole-top mounted.

86-6.08B Equipment Details

86-6.08B(1) Photoelectric Unit

Photoelectric unit must:

1. Have an output in response to changing light levels. Response level must remain stable throughout life of control unit.
2. Have a "turn-on" between 1 and 5 footcandles, and a "turn-off" between 1.5 and 5 times "turn-on." Measurements must be made by procedures in EEI-NEMA standards for physical and electrical interchangeability of light-sensitive control devices used in the control of roadway lighting.
3. Have a EEI-NEMA type receptacle. Mounting brackets must be used where pole-top mounting is not possible. Photoelectric controls must be installed at locations show on the plans and oriented.
4. Be screened to prevent artificial light from causing cycling.
5. Have a supply voltage rating of 60 Hz, 105-130 V(ac), 210-240 V(ac), or 105-240 V(ac), as specified.
6. Have a load rating of 800 W minimum, incandescent, high intensity discharge, or fluorescent.
7. Operate at a temperature range of -20 °C to 55 °C.
8. Have a power consumption less than 10 W.
9. Be housed in a weatherproof enclosure.
10. Have a base with a 3-prong, EEI-NEMA standard, twist-lock plug mounting.
11. Have a "fail-on" feature.

Unit components must not require periodic replacement.

Photoelectric controls, except Type IV and Type V, must include a 4-inch minimum inside diameter, pole-top mounting adaptor containing a terminal block, and cable supports or clamps to support pole wires.

For switching 480 V(ac), 60 Hz circuits, a 100 VA, minimum, 480/120 V(ac) transformer must be installed in the contactor enclosure to allow 120 V(ac) for the photoelectric control unit. If more than 1 photoelectric unit is to be installed at a location, a single transformer with a volt-ampere rating capable of handling the total controlled load, may be used.

86-6.08B(2) Contactor

Contactor must:

1. Have contacts rated to switch the specified lighting load
2. Be normally open
3. Be the mechanical armature type with contacts of fine silver, silver alloy, or superior alternative material

86-6.08B(3) Enclosure

Enclosure for Type I and Type III photoelectric controls must be NEMA 3R. Enclosure must be supplied with a factory-applied rust-resistant prime coat and finish coat. Two applications of paint to match the color of the standard must be applied as specified in Section 86-2.16, "Painting." Enclosure may be hot-dip galvanized instead of painting. A minimum of 2-1/2 inches must be provided between contactor terminals and end of enclosure for wiring connections. Enclosure must be mounted on the same standard as the photoelectric unit at a height of about 6 feet above finished grade.

86-6.08B(4) Terminal Blocks

Terminal blocks must be rated at 25 A, 600 V(ac), molded from phenolic or nylon material, and of the barrier type with plated-brass screw terminals and integral-type marking strips.

86-6.09 TRANSFORMERS

Multiple-to-multiple transformers must be single-phase dry type designed for operation on a 60 Hz supply.

86-6.09A Electrical Requirements

Transformers must have a decal showing a connection diagram. Diagram must show either color-coding or wire-tagging with primary (H1, H2) or secondary (X1, X2) markers, and the primary and secondary voltage and volt-ampere rating. Transformers must comply with the following:

Transformer Electrical Requirements

Transformer Characteristic	Multiple-to-Multiple Unit
Rating	120/480 V(ac), 240/480 V(ac), or 480/120 V(ac)
Efficiency	Exceed 95 percent
Secondary Voltage Regulation and Tolerance	±3 percent from half load to full load

Secondary 480 V(ac) windings must be center-tapped.

86-6.09B Physical Requirements

External leads for multiple-to-multiple secondary connections must be Type USE, No. 10, rated 600 V(ac).

Transformer leads must extend a minimum of 12 inches from the case.

Transformer insulation must be NEMA 185 C or better.

Multiple-to-multiple transformers must withstand the application of 2,200 V(ac) from core to coils and from coil to coil for a 1-minute period.

The above tests must be made immediately after operation of transformer at full load for 24 hours.

Non-submersible transformers must include metal half-shell coil protection, have moisture resistant synthetic varnish impregnated windings, and be suitable for outdoor operation in a raintight enclosure.

Each transformer to be installed in a pull box must be the submersible type and include a handle and a hanger.

86-6.09C Submersible Type Transformers

Submersible type transformers must be securely encased in a rugged corrosion resistant, watertight case and must withstand a 5-day test submerged in 2 feet of salt water, 2 percent salt by weight, with 12-hour on and off periods. The operating periods must be at full load.

Leads of submersible transformers must be brought out through one or more sealed hubs and secured to withstand a 100 pound static pull without loosening or leaking.

86-6.10 (BLANK)

86-6.11 FALSEWORK LIGHTING

86-6.11A General

Falsework lighting must include lighting to illuminate the pavement, portals, and pedestrian walkways at or under openings in the falsework required for traffic.

Lighting for pedestrian walkway illumination must be installed at all pedestrian openings through or under falsework.

Before starting falsework opening construction, you must submit a plan of proposed lighting installations for review and obtain approval. Approval will be made as specified in Section 5-1.02, "Plans and Working Drawings."

You must design falsework lighting so that required maintenance can be performed with a minimum of inconvenience to public traffic. Closing of traffic lanes for routine maintenance will not be permitted on roadways with posted speed limits greater than 25 mph.

Pavement under falsework with portals less than 150 feet apart and falsework portals must be illuminated only during the hours of darkness as defined in Division 1, Section 280, of the California Vehicle Code. Photoelectric switches must be used to control falsework lighting systems. Pavement under falsework with portals 150 feet or more apart and all pedestrian openings through falsework must be illuminated 24 hours per day.

Lighting fixtures must be aimed to avoid glare to oncoming motorists.

Type NMC cable with No. 12 minimum conductors, with ground wire, must be used. Fasten cable to supporting structure at sufficient intervals to adequately support cable and within 12 inches from every box or fitting. Conductors within 8 feet of ground must be enclosed in a 1/2 inch or larger metal conduit.

Each illumination system must be on a minimum of 1 separate branch circuit at each bridge location. Each branch circuit must be fused, not to exceed 20 A.

For falsework lighting, you must arrange with the serving utility to complete service connections. You must pay for energy, line extension, service, and service hookup costs.

At completion of project or when ordered by the Engineer, falsework lighting equipment will become your property and you must remove it from the job site.

You may propose a lighting plan that fulfills light intensity requirements to the systems specified herein. You must supply sufficient data to allow evaluation of alternative methods.

86-6.11B Pavement Illumination

Illumination of pavement at vehicular openings through falsework must comply with the following:

1. Fixture must include R/FL commercial type floodlamp holder with protective covers.
2. Fixture must be fully adjustable with brackets and locking screws, and allow mounting directly to a standard metal junction box.
3. Lamp must be medium-base 120 V(ac), 120 W, minimum, PAR-38 quartz-halogen floodlamp.
4. A continuous row of fixture types required must be installed at locations and spacing specified. Fixtures must be installed beneath falsework structure, with the end fixtures not further than 10 feet inside portal faces. Fixtures must be installed and energized immediately after the members supporting them have been erected.
5. Fixtures along the sides of the opening must be placed not more than 4 feet behind or 2 feet in front of the roadway face of the temporary railing. Mounting heights of fixtures must be between 12 and 16 feet above the roadway surface and must present an unobstructed light pattern on the pavement.

86-6.11C Portal Illumination

Illumination of falsework portals must comply with the following:

1. On each side of each entrance portal, plywood sheet clearance guides, 4 feet wide by 8 feet high, must be fastened vertically, facing traffic, with the bottom of the panel 3 feet to 4 feet above the roadway. The center of the panel must be located approximately 3 feet horizontally behind the roadway face of the railing. Panels must be freshly painted for each installation with not less than 2 applications of flat white paint. Paint testing will not be required.
2. If ordered by the Engineer, in order to improve the general appearance of the painted surfaces, you must repaint designated areas and that painting will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."
3. Falsework portals must be illuminated on the side facing traffic with 150 W, minimum, PAR reflector floodlamps mounted on the structure directly over each vertical support adjacent to the traveled way, as needed to uniformly illuminate the exterior falsework beam, the clearance guides, and the overhead clearance sign. Each lamp must be supported approximately 16 feet above the pavement and approximately 6 feet in front of the portal face.
4. Portal lighting and clearance guides must be installed on the day that vertical members are erected.

86-6.11D Pedestrian Walkway Illumination

Illumination of pedestrian openings through or under falsework must comply with the following:

1. Fixtures must be flush-mounted in the overhead protection shield and equipped with a damage-resistant clear polycarbonate diffuser lens. Lamps must be standard incandescent 100 W, 120 V(ac).
2. Fixtures must be centered over the passageway at intervals of not more than 15 feet with the end fixtures not more than 7 feet inside the end of the pedestrian openings.
3. Pedestrian passageway light systems must be installed immediately after the overhead protection shield is erected.

86-7 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

86-7.01 REMOVING ELECTRICAL EQUIPMENT

Existing electrical equipment, pull boxes, and conduits, to be removed and not reused or salvaged, become your property and you must dispose of it under Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way." Unused underground conduit may be abandoned in place after all conductors have been removed, except that conduit terminations from conduit to be abandoned must be removed from pull boxes to remain.

Exercise care in salvaging equipment so that it will not be damaged or destroyed. Mast arms must be removed from standards. Luminaires, signal heads, and signal mounting assemblies must be removed from standards and mast arms.

Holes resulting from removing pull boxes must be filled with material equivalent to the surrounding material.

86-7.02 REINSTALLING REMOVED ELECTRICAL EQUIPMENT

If removed electrical equipment is to be reinstalled, you must supply all necessary materials and equipment, including signal mounting assemblies, anchor bolts, nuts, washers, and concrete as required to complete the new installation.

Luminaires to be reinstalled must be cleaned and relamped.

Existing materials required to be reused and found to be unsatisfactory by the Engineer must be replaced with new material and the replacement cost will be paid for as extra work as specified in Section 4-1.03D, "Extra Work."

86-8 PAYMENT

86-8.01 PAYMENT

The contract lump sum price or prices paid for signal, ramp metering, flashing beacon, lighting, sign illumination, traffic monitoring station, highway advisory radio systems, closed circuit television systems, or combinations thereof; for modifying or removing those systems; for temporary systems; or the lump sum or unit prices paid for various units of those systems; or the lump sum or per foot price paid for conduit of the various sizes, types, and installation methods listed in the Engineer's Estimate include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing, modifying, or removing the systems, combinations or units thereof, including any necessary pull boxes (except if the type required is shown as a separate contract item); excavation and backfill; concrete foundations (except if shown as a separate contract item); pedestrian barricades; furnishing and installing illuminated street name signs; installing sign panels on pedestrian barricades, on flashing beacon standards, and on traffic signal mast arms; restoring sidewalk, pavement and appurtenances damaged or destroyed during construction; salvaging existing materials; and making all required tests, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

If poles for electrical systems are manufactured from a source located more than 300 air-line miles from Sacramento and Los Angeles, the Department will deduct $5,000 for inspection costs for each inspection site. If poles for electrical systems are manufactured from a source located more than 3,000 air-line miles from Sacramento and Los Angeles, the Department will deduct $8,000 for inspection costs for each inspection site.

Full compensation for all additional materials and labor, not shown on the plans or specified, that are necessary to complete the installation of the various systems, is included in the prices paid for the systems, or units thereof, except as provided in Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems," and no additional compensation will be allowed therefor.

If shown as a contract item, the contract price paid per foot for cast-in-drilled-hole concrete pile (signal foundation) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing reinforced concrete pile foundations of the size shown on the Engineer's Estimate, including drilling holes, disposing of the material resulting from drilling holes, furnishing and placing anchor bolt assemblies and reinforcing steel, complete in place, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

If shown as a contract item, non-reinforced PCC foundations will be measured and paid for by the cubic yard for foundation concrete in the same manner as specified for minor concrete (minor structure) in Section 51, "Concrete Structures."

If shown as a separate contract item by the lump sum or per foot, interconnection conduit and cable includes all interconnection conductors, and conduit and pull boxes containing interconnection cable and no other conductors. The quantity of interconnection conduit and cable to be paid for by the foot is the length of that conduit. Compensation for conduit containing interconnection cable and other conductors is included in the contract price paid for the item requiring the other conductors.

Full compensation for furnishing, installing, maintaining, and removing falsework lighting equipment is included in the contract prices paid for the items of work involved in the structure that requires the falsework lighting and no additional compensation will be allowed therefor.

^^

SECTION 88 ENGINEERING FABRICS
(Issued 01-20-12)

Replace Section 88 with:

SECTION 88 GEOSYNTHETICS

88-1.01 GENERAL

88-1.01A Summary

Section 88 includes specifications for geosynthetics. Geosynthetics are used for:

1. Filtration
2. Drainage
3. Reinforcement
4. Water pollution control
5. Channel and shore protection
6. Pavement interlayer
7. Separation and stabilization

88-1.01B Submittals

Submit:

1. Certificate of Compliance under Section 6-1.07, "Certificates of Compliance"
2. Samples representing each lot
3. Minimum average roll values (MARV)

Label submittals with the manufacturer's name and product information.

88-1.01C Quality Control and Assurance

Treat geosynthetics to resist degradation from exposure to sunlight. Using covers, protect geosynthetics from moisture, sunlight, and shipping and storage damage.

88-1.02 FILTRATION

88-1.02A Filter Fabric

Geosynthetics used for filter fabric must be permeable and nonwoven. Filter fabric must consist of 1 of the following:

1. Polyester
2. Polypropylene
3. Combined polyester and polypropylene

Filter fabric must comply with:

Filter Fabric

Property	ASTM	Specification		
		Class A	Class B	Class C
Grab breaking load, 1-inch grip, lb minimum in each direction	D 4632	157		
Apparent elongation, percent minimum in each direction	D 4632	50		
Puncture strength, lb minimum	D 6241	600		
Ultraviolet resistance, percent minimum retained grab breaking load, 500 hr	D 4355	70		
Permittivity, sec^{-1} minimum	D 4491	0.5	0.2	0.1
Apparent opening size, average roll value, U.S. Standard sieve size maximum	D 4751	40	60	70

88-1.03 DRAINAGE

88-1.03A Geocomposite Wall Drain

Geocomposite wall drain must consist of a polymeric core with filter fabric integrally bonded to 1 or both sides of the core creating a stable drainage void.

Filter fabric must comply with Section 88-1.02, "Filtration."

Geocomposite wall drain must comply with:

Geocomposite Wall Drain

Property	ASTM	Specification
Thickness with fabric, inches maximum	--	2
Transmissivity, gradient = 1.0, normal stress = 5,000 psf, gal/min/ft	D 4716	4

88-1.04 REINFORCEMENT

88-1.04A Geotechnical Subsurface Reinforcement

General

Geosynthetic used for geotechnical subsurface reinforcement must be either of the following:

1. Geotextile
2. Geogrid

Geotextile permittivity must be at least 0.05 sec^{-1} determined under ASTM D 4491.

Geogrid must have a regular and defined open area. The open area must be from 50 to 90 percent of the total grid area.

Long Term Design Strength

Long Term Design Strength (LTDS) of geosynthetic reinforcement is the ultimate tensile strength in the primary strength direction divided by reduction factors. Calculate the LTDS from the guidelines in Geosynthetic Research Institute (GRI) Standard Practice GG4a, GRI GG4b, or GRI GT7.

The product of the appropriate reduction factors must be at least 1.30. Determine the reduction factor for creep using a 75-year design life for permanent applications and a 5-year design life for temporary applications. Determine the installation damage reduction factor based on the characteristics of the backfill materials used.

If test data is not available, use default values of reduction factors in the GRI Standard Practice to calculate LTDS.

Submit the LTDS and its supporting calculations at least 15 days before placing geosynthetic reinforcement. Do not install before the Engineer's approval. The LTDS must be signed by an engineer who is registered as a civil engineer in the State.

88-1.05 WATER POLLUTION CONTROL

Geosynthetics used for water pollution control must comply with:

Water Pollution Control Geosynthetics

Property	ASTM	Application						
		Silt Fence		Sediment Filter Bag		Gravel-Filled Bags	Temporary Cover	
		Woven	Non-woven	Woven	Non-woven		Woven	Non-woven
Grab breaking load, 1-inch grip, lb minimum in each direction	D 4632	120	120	200	250	205	200	200
Apparent elongation, percent minimum, in each direction	D 4632	15	50	10	50	--	15	50
Water flow rate, gallons per minute/square foot minimum and maximum average roll value	D 4491	10 - 100	100 - 150	100 - 200	75 - 200	80 - 150	4 - 10	80 - 120
Permittivity, sec^{-1} minimum	D 4491	0.05	1.1	1.0	1.0	0.2	0.05	1.0
Apparent opening size, inches maximum average roll value	D 4751	0.023	0.012	0.023	0.012	0.016	0.023	0.012
Ultraviolet resistance, percent minimum retained grab breaking load, 500 hr.	D 4355	70	70	70	70	70	70	70

88-1.06 CHANNEL AND SHORE PROTECTION

88-1.06A Rock Slope Protection

Rock slope protection (RSP) fabric must be a permeable, nonwoven, needle-punched geotextile. RSP fabric consists of 1 of the following:

1. Polyester
2. Polypropylene
3. Combined polyester and polypropylene

Polymers must be either virgin compounds or clean reworked material. Do not subject virgin compounds to use or processing other than required for initial manufacture. Clean reworked material must be previously processed material from the processor's own production that has been reground, pelletized, or solvated. RSP fabric must not consist of more than 20 percent by weight of clean reworked material. Do not use recycled materials from either post-consumer or post-industrial sources.

Class 8 or Class 10 RSP fabric must comply with:

Rock Slope Protection Fabric

Property	ASTM	Specification	
		Class 8	Class 10
Weight, oz/yd^2 minimum	D 5261	7.5	9.5
Grab breaking load, lb 1-inch grip, min. in each direction	D 4632	200	250
Apparent elongation, percent min., in each direction	D 4632	50	50
Permittivity, sec^{-1}, minimum	D 4491	1.0	0.70
Apparent opening size, U.S. Standard sieve size minimum and maximum	D 4751	70 - 100	70 - 100
Ultraviolet resistance, percent minimum retained grab breaking load, 500 hr.	D4355	70	70

88-1.07 PAVEMENT INTERLAYER

88-1.07A Paving Fabric

Geosynthetics used for paving fabric must be nonwoven. Paving fabric must comply with:

Geosynthetic Paving Fabric

Property	ASTM	Specification
Mass per unit area, oz/yd^2 minimum	D 5261	4.1
Grab breaking load, lb 1-inch grip, minimum, in each direction	D 4632	100
Apparent elongation, percent minimum in each direction	D 4632	50
Hydraulic bursting strength, psi minimum	D 3786	200
Melting point, °F minimum	D 276	325
Asphalt retention, gal/yd^2 minimum	D 6140	0.2

88-1.07B Paving Mat

Geosynthetics used for paving mat must be a nonwoven fiberglass and polyester hybrid material. Paving mat must comply with:

Geosynthetic Paving Mat

Property	ASTM	Specification
Breaking force, lb/2 inches minimum	D 5035	45
Ultimate elongation, percent maximum	D 5035	5
Mass per unit area, oz/ sq yd minimum	D 5261	3.7
Melting point, °F minimum	D 276	400
Asphalt retention, gal/yd^2 minimum	D 6140	0.10

88-1.07C Paving Grid

Geosynthetics used for paving grid must be a geopolymer material formed into a grid of integrally connected elements with openings. Paving grid must comply with:

Geosynthetic Paving Grid

Property	Test	Specification		
		Class I	Class II	Class III
Tensile strength at ultimate, lb/in [a] minimum	ASTM D 6637	560 x 1,120	560	280
Aperture size, inch minimum	Calipered	0.5	0.5	0.5
Elongation, % maximum	ASTM D 6637	12	12	12
Mass per area, oz / sqyd minimum	ASTM D 5261	16	10	5.5
Melting point, °F minimum	ASTM D 276	325	325	325

Note:
[a] For Class I, machine direction x cross direction. For Class II and Class III, both directions.

88-1.07D Paving Geocomposite Grid

Paving geocomposite grid consists of paving grid specified under Section 88-1.07C, "Paving Grid," bonded or integrated with paving fabric specified under Section 88-1.07A, "Paving Fabric."

Paving geocomposite grid must have a peel strength of at least 10 pounds per foot determined under ASTM D 413.

88-1.07E Geocomposite Strip Membrane

Geocomposite strip membrane must consist of various widths of strips manufactured from of asphaltic rubber and geosynthetics. Geocomposite strip membrane must comply with:

Geocomposite Strip Membrane

Property	ASTM	Specification
Strip tensile strength, lbs/inch minimum	D 882	50
Elongation at break, % minimum	D 882	50
Resistance to puncture, lbs. minimum	E 154	200
Permeance, perms maximum	E 96/E 96M	0.10
Pliability, 1/4 inch mandrel with sample conditioned at 25 °F	D 146	No cracks in fabric or bitumen
Melting point, °F	D 276	325

88-1.08 SEPARATION AND STABILIZATION

88-1.08A Subgrade Enhancement Geotextile

Subgrade enhancement geotextile must consist of either of the following:

1. Polyester
2. Polypropylene

Subgrade enhancement geotextile must comply with:

Subgrade Enhancement Geotextile

Property	ASTM	Specification [a]				
		Class A1	Class A2	Class B1	Class B2	Class B3
Elongation at break, %	D 4632	<50	≥50	<50	<50	≥50
Grab tensile strength, lb minimum	D4632	250	160	--	320	200
Wide width tensile strength at 5% strain, lb/ft minimum	D 4595	--	--	2,000	--	--
Wide width tensile strength at ultimate strength, lb/ft minimum	D 4595	--	--	4,800	--	--
Tear strength, lb minimum	D 4533	90	60	--	120	80
Puncture strength, lb minimum	D 6241	500	310	620	620	430
Permittivity, sec^{-1} minimum	D 4491	0.05	0.05	0.20	0.20	0.20
Apparent opening size, inches maximum	D 4751	0.012	0.012	0.024	0.012	0.012
Ultraviolet stability (retained strength after 500 hrs exposure), % minimum	D 4355	70	70	70	70	70

Notes:
[a] Specifications are based on minimum average roll value in the weaker principle direction except apparent opening size is based on maximum average roll value.

88-1.09 PAYMENT

The Department measures and pays for geosynthetics under the specifications requiring their use.

^^

SECTION 90 PORTLAND CEMENT CONCRETE
(Issued 08-05-11)

Replace Section 90 with:

SECTION 90 PORTLAND CEMENT CONCRETE

90-1 GENERAL

90-1.01 DESCRIPTION

Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.

The Contractor shall determine the mix proportions for concrete in conformance with these specifications.

Minor concrete shall contain not less than 505 pounds of cementitious material per cubic yard unless otherwise specified in these specifications or the special provisions.

Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic yard of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (Pounds/CY)
Concrete designated by compressive strength:	
Deck slabs and slab spans of bridges	675 min., 800 max.
Roof sections of exposed top box culverts	675 min., 800 max.
Other portions of structures	590 min., 800 max.
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	675 min.
Roof sections of exposed top box culverts	675 min.
Prestressed members	675 min.
Seal courses	675 min.
Other portions of structures	590 min.
Concrete for precast members	590 min., 925 max.

Except for minor structures, the minimum required compressive strength for concrete in structures or portions of structures shall be the strength specified, or 3600 pounds per square inch at 28 days, whichever is greater.

Except for when a modulus of rupture is specified, the minimum required compressive strength for concrete shall be the strength specified, or 2,500 pounds per square inch, whichever is greater. Concrete shall be proportioned such that the concrete will attain the minimum required compressive strength.

If the specified 28-day compressive strength is 3,600 pounds per square inch or greater, the concrete is designated by compressive strength. For concrete with a 28-day compressive strength greater than 3,600 pounds per square inch, 42 days will be allowed to obtain the specified strength.

For concrete not designated by compressive strength, the Engineer may test the concrete for compressive strength. The concrete will be accepted if the compressive strength at 28 days attains 85 percent or more of the minimum required compressive strength.

Concrete shall be proportioned to conform to the following shrinkage limitations when tested in conformance with the requirements of AASHTO Designation: T 160, modified as follows:

Condition	Maximum Shrinkage of Laboratory Cast Specimens at 28 days Drying (average of 3, %)
Paving and approach slab concrete	0.050
Bridge deck concrete	0.045

Note: Shrinkage requirement is waived for concrete that is used for precast elements.

Shrinkage tests shall be either:

A. Performed by a laboratory accredited to perform AASHTO Designation: T 160, or
B. Performed by a laboratory that maintains a current rating of 3 or better for the Cement and Concrete Reference Laboratory (CCRL) concrete proficiency sample program.

Laboratory cast specimens shall have a 4" x 4" cross section. Specimens shall be removed from the molds 23 ± 1 hours after mixing the concrete and placed in lime water at 73 ± 3 °F to 7 days age. A comparator reading shall be taken at 7 days age and recorded as the initial reading. Specimens then shall be stored in a humidity controlled room maintained at 73 ± 3 °F and 50 ± 4 percent relative humidity for the remainder of the test. Subsequent readings shall be taken at 7, 14, 21, and 28 days drying.

Test data verifying conformance to the shrinkage limitations shall be submitted with the mix design. Shrinkage testing data accepted by the Engineer no more than 3 years prior to the first working day of this contract will be acceptable for this entire contract, provided the data was for concrete with similar proportions and the same materials and material sources to be used on this contract. Concrete shall be considered to have similar proportions if, when compared to concrete to be used on this project, no more than 2 mix design elements are varied. Varied mix design elements shall fall within the tolerances in the following table:

Mix Design Element	Tolerance (±)
Water to cementitious material ratio	0.03
Total water content	5 %
Coarse aggregate (weight per cubic yard)	10 %
Fine aggregate (weight per cubic yard)	10 %
Supplementary cementitious material content	5 %
Admixture (as originally dosed)	25 %

Note: Admixtures must be of the same brand.

Before using concrete or in advance of revising the mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.

Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, supplementary cementitious material (SCM) shall be considered to be cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.

If any concrete has a cementitious material, portland cement, or SCM content that is less than the minimum required, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State $0.25 for each pound of cementitious material, portland cement, or SCM that is less than the minimum required. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions will be made based on the results of California Test 518.

The requirements of the preceding paragraph shall not apply to minor concrete.

90-2 MATERIALS

90-2.01 CEMENTITIOUS MATERIALS

Unless otherwise specified, cementitious material shall be either a combination of Type II or Type V portland cement and SCM, or a blended cement. No cementitious material shall be used in the work unless it is on the Department's Pre-Qualified Products List at the time of mix design submittal. Information regarding cementitious material qualification and placement on the Department's approved list can be obtained at the Transportation Laboratory.

Cementitious materials used in cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same sources and of the same proportions.

Cementitious materials shall be protected from moisture until used. Sacked cementitious materials shall be piled to permit access for tallying, inspecting, and identifying each shipment.

Facilities shall be provided to ensure that the various cementitious materials meeting this Section 90-2.01 are kept separate from each other and from other cementitious materials. A storage silo containing a cementitous material shall be emptied before using that silo for a different cementitious material. Blended cements with a percentage of SCM differing by more than 2 percentage points are considered different cementitious materials. Sampling cementitious materials shall be in conformance with California Test 125.

The Contractor shall furnish a Certificate of Compliance for cementitious materials in conformance with the provisions in Section 6-1.07, "Certificates of Compliance." The Certificate of Compliance shall indicate the source by name and location (including country, state, and city). If cementitious material is delivered directly to the job site, the Certificate of Compliance shall be signed by the cementitious material supplier. If the cementitious material is used in ready-mixed concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product. If blended cement is used, the Certificate of Compliance shall include a statement signed by the blended cement supplier that indicates the actual percentage, by weight, of SCM in the blend. Weight of SCM shall be by weighing device conforming to Section 9-1.01, "Measurement of Quantities," or as determined by chemical analysis.

90-2.01A Cement

Portland cement shall conform to the requirements in ASTM Designation: C 150 except the C_3S content of Type II cement shall not exceed 65 percent.

Blended cement shall conform to the requirements for Portland Blast-Furnace Slag Cement, Type IS (MS) or Portland-Pozzolan Cement, Type IP (MS) in AASHTO Designation: M 240, except that the maximum limits on the pozzolan content shall not apply. Blended cement shall be comprised of Type II or Type V cement and SCM produced by intergrinding portland cement clinker and granulated blast furnace slag, ground granulated blast furnace

slag (GGBFS), or pozzolan; by blending portland cement and either GGBFS or finely divided pozzolan; or by a combination of intergrinding and blending.

In addition, Type II portland cement and Type V portland cement shall conform to the following requirements:

A. The cement shall not contain more than 0.60-percent by mass of alkalies, calculated as the percentage of Na_2O plus 0.658 times the percentage of K_2O, when determined by methods as required in AASHTO Designation: T 105; and
B. The autoclave expansion shall not exceed 0.50-percent

Type III portland cement shall be used only as specified or with the approval of the Engineer. Type III portland cement shall conform to the additional requirements listed above for Type II portland cement. The Contractor may use Type III portland cement in the manufacturing of precast concrete.

90-2.01B Supplementary Cementitious Materials

Each supplementary cementitious material shall conform to one of the following:

A. Fly ash conforming to the requirements in AASHTO Designation: M 295, Class F, and these specifications. The available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311 or the total alkali, as sodium oxide equivalent, shall not exceed 5.0 percent when determined in conformance with the requirements in AASHTO Designation: T 105.
B. Ultra fine fly ash (UFFA) conforming to the requirements in AASHTO Designation: M 295, Class F, and the following chemical and physical requirements:

Chemical Requirements	Percent
Sulfur Trioxide (SO_3)	1.5 max.
Loss on ignition	1.2 max.
Available Alkalies (as Na_2O) equivalent	1.5 max.

Physical Requirements	Percent
Particle size distribution	
Less than 3.5 microns	50
Less than 9.0 microns	90
Strength Activity Index with portland cement	
7 days	95 (minimum % of control)
28 days	110 (minimum % of control)
Expansion at 16 days when testing job materials in conformance with ASTM C 1567*	0.10 max.

* In the test mix, Type II or Type V portland cement shall be replaced with at least 12% UFFA by weight.

C. Raw or calcined natural pozzolans conforming to the requirements in AASHTO Designation: M 295, Class N. and the following requirements and these specifications. The available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311 or the total alkali, as sodium oxide equivalent, shall not exceed 5.0 percent when determined in conformance with the requirements in AASHTO Designation: T 105.
D. Metakaolin conforming to the requirements in AASHTO Designation: M 295, Class N, and the following chemical and physical requirements:

Chemical Requirements	Percent
Silicon Dioxide (SiO_2) + Aluminum Oxide (Al_2O_3)	92.0 min.
Calcium Oxide (CaO)	1.0 max
Sulfur Trioxide (SO_3)	1.0 max.
Loss on ignition	1.2 max.
Available Alkalies (as Na_2O) equivalent	1.0 max.

Physical Requirements	Percent
Particle size distribution Less than 45 microns	95
Strength Activity Index with portland cement 7 days 28 days	 100 (minimum % of control) 100 (minimum % of control)

E. Ground Granulated Blast Furnace Slag (GGBFS) conforming to the requirements in AASHTO Designation: M 302, Grade 100 or Grade 120.
F. Silica Fume conforming to the requirements of AASHTO Designation: M 307, with reduction in mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

Commingling of fly ash from different sources at uncontrolled ratios is permissible only if the following criteria are satisfied:

A. Sources of fly ash to be commingled shall each produce fly ash that conforms to the requirements in AASHTO Designation: M 295, Class F.
B. Testing of the commingled product is the responsibility of the fly ash supplier.
C. Each fly ash's running average of relative density shall not differ from any other by more than 0.25 at the time of commingling.
D. Each fly ash's running average of loss on ignition shall not differ from any other by more than one percent at the time of commingling.
E. The final product of commingled fly ash shall conform to the requirements in AASHTO Designation: M 295, Class F.

90-2.01C Required Use Of Supplementary Cementitious Materials

General

The amount of portland cement and SCM used in portland cement concrete shall conform to the minimum cementitious material content provisions in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and these specifications.

The SCM content in portland cement concrete shall conform to one of the following:

A. Any combination of portland cement and at least one SCM, satisfying Equations (1) and (2):

Equation (1)

$$\frac{(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)}{MC} \geq X$$

Where:

UF = Silica fume, metakaolin, or UFFA, including the amount in blended cement, pounds per cubic yard.
FA = Fly ash or natural pozzolan conforming to the requirements in AASHTO Designation: M 295, Class F or N with a CaO content up to 10 percent, including the amount in blended cement, pounds per cubic yard.
FB = Fly ash or natural pozzolan conforming to the requirements in AASHTO Designation: M 295, Class F or N with a CaO content greater than 10 percent and up to 15 percent, including the amount in blended cement, pounds per cubic yard.
SL = GGBFS, including the amount in blended cement, pounds per cubic yard.
MC = Minimum amount of cementitious material specified, pounds per cubic yard.
X = 1.8 for innocuous aggregate, 3.0 for all other aggregate.

Equation (2)

$$MC - MSCM - PC \geq 0$$

Where:

MC = Minimum amount of cementitious material specified, pounds per cubic yard.
MSCM = The minimum sum of SCMs that satisfies Equation (1) above, pounds per cubic yard.
PC = The amount of portland cement, including the amount in blended cement, pounds per cubic yard.

B. 15 percent of Class F fly ash with at least 48 ounces of $LiNO_3$ solution added per 100 pounds of portland cement. CaO content of the fly ash shall not exceed 15 percent.

Precast Concrete

The SCM content in precast portland cement concrete shall conform to one of the following:

A. Any combination of portland cement and SCM, satisfying the following equation:

Equation (3)

$$\frac{(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)}{TC} \geq X$$

Where:

UF = Silica fume, metakaolin, or UFFA, including the amount in blended cement, pounds per cubic yard.
FA = Fly ash or natural pozzolan conforming to the requirements in AASHTO Designation: M 295, Class F or N with a CaO content up to 10 percent, including the amount in blended cement, pounds per cubic yard.
FB = Fly ash or natural pozzolan conforming to the requirements in AASHTO Designation: M 295, Class F or N with a CaO content greater than 10 percent and up to 15 percent, including the amount in blended cement, pounds per cubic yard.
SL = GGBFS, including the amount in blended cement, pounds per cubic yard.
TC = Total amount of cementitious material used in the mix, pounds per cubic yard.
X = 0.0 if precast members are constructed with portland cement concrete using aggregate that is "innocuous" in conformance with the provisions in Section 90-2.02, "Aggregates."
X = 3.0 for all other aggregate.

B. 15 percent of Class F fly ash with at least 48 ounces of $LiNO_3$ solution added per 100 pounds of portland cement. CaO content of the fly ash shall not exceed 15 percent.
C. Any combination of supplementary cementitious material and portland cement may be used if the expansion of cementitious material and aggregate does not exceed 0.10 percent when tested in conformance with the requirements in ASTM C 1567. Test data shall be submitted with each mix design. Test data accepted by the Engineer no more than 3 years prior to the first working day of this contract will be acceptable for this entire contract, provided the data was for the same concrete mix and the same materials and material sources to be used on this contract.

90-2.02 AGGREGATES

To be considered innocuous, aggregate must be on the Department's approved list, "Innocuous Aggregates for use in Concrete." Information regarding aggregate qualification and placement on the Department's approved list can be obtained at the Transportation Laboratory.

Both coarse and fine aggregate must be on the approved list for the aggregate used in concrete to be considered innocuous.

Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.

The Contractor shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California Test 125.

Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."

Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California Test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index, D_f, of the fine aggregate is 60 or greater when tested for durability in conformance with California Test 229.

If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."

If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State $3.50 per cubic yard for paving concrete and $5.50 per cubic yard for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete which is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State $3.50 per cubic yard for paving concrete and $5.50 per cubic yard for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs are in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."

No single Cleanness Value, Sand Equivalent, or aggregate grading test shall represent more than 300 cubic yards of concrete or one day's pour, whichever is smaller.

When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

90-2.02A Coarse Aggregate

Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, reclaimed aggregate, crushed air-cooled iron blast furnace slag or combinations thereof. Crushed air-cooled blast furnace slag shall not be used in reinforced or prestressed concrete.

Reclaimed aggregate is aggregate that has been recovered from plastic concrete by washing away the cementitious material. Reclaimed aggregate shall conform to all aggregate requirements.

Coarse aggregate shall conform to the following quality requirements:

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions)	211	45% max.
Cleanness Value		
Operating Range	227	75 min.
Contract Compliance	227	71 min.

In lieu of the above Cleanness Value requirements, a Cleanness Value "Operating Range" limit of 71, minimum, and a Cleanness Value "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the coarse aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

A. Coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested in conformance with the requirements in California Test 227; and

B. Prequalification tests performed in conformance with the requirements in California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.02B Fine Aggregate

Fine aggregate shall consist of natural sand, manufactured sand produced from larger aggregate or a combination thereof. Manufactured sand shall be well graded.

Fine aggregate shall conform to the following quality requirements:

Test	California Test	Requirements
Organic Impurities	213	Satisfactory[a]
Sand Equivalent:		
Operating Range	217	75, min.
Contract Compliance	217	71, min.

[a] Fine aggregate developing a color darker than the reference standard color may be accepted if 95% relative mortar strength is achieved when tested in conformance with ASTM C87.

In lieu of the above Sand Equivalent requirements, a Sand Equivalent "Operating Range" limit of 71, minimum, and a Sand Equivalent "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the fine aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

A. Fine aggregate sampled at the completion of processing at the aggregate production plant had a Sand Equivalent value of not less than 82 when tested by California Test 217; and
B. Prequalification tests performed in conformance with California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.03 WATER

In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1,000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1,300 parts per million of sulfates as SO_4, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1,300 parts per million of sulfates as SO_4, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either of the following results when compared to the same test using distilled or deionized water: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109.

In nonreinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2,000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1,500 parts per million of sulfates as SO_4, when tested in conformance with California Test 417.

In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis ($Na_2O + 0.658\ K_2O$) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

90-2.04 Admixture Materials

Admixture materials shall be stored and dispensed in liquid form and conform to the following requirements:

A. Chemical Admixtures—ASTM Designation: C 494.
B. Air-entraining Admixtures—ASTM Designation: C 260.
C. Lithium Nitrate shall be in an aqueous solution conforming to the following:

1. Lithium Nitrate ($LiNO_3$) must be 30 percent +/- 0.5 percent by weight
2. Sulfate (SO_4) must be less than 1000 ppm
3. Chloride (Cl) must be less than 1000 ppm
4. Alkalis (Na_2O + 0.658 K_2O) must be less than 1000 ppm

90-3 AGGREGATE GRADINGS

90-3.01 GENERAL

Before beginning concrete work, the Contractor shall submit in writing to the Engineer the gradation of the primary aggregate nominal sizes that the Contractor proposes to furnish. If a primary coarse aggregate or the fine aggregate is separated into 2 or more sizes, the proposed gradation shall consist of the gradation for each individual size, and the proposed proportions of each individual size, combined mathematically to indicate one proposed gradation. The proposed gradation shall meet the grading requirements shown in the table in this section, and shall show the percentage passing each of the sieve sizes used in determining the end result.

The Engineer may waive, in writing, the gradation requirements in this Section 90-3.01 and in Sections 90-3.02, "Coarse Aggregate Grading," 90-3.03, "Fine Aggregate Grading," and 90-3.04, "Combined Aggregate Gradings," if, in the Engineer's opinion, furnishing the gradation is not necessary for the type or amount of concrete work to be constructed.

Gradations proposed by the Contractor shall be within the following percentage passing limits:

Primary Aggregate Nominal Size	Sieve Size	Limits of Proposed Gradation
1-1/2" x 3/4"	1"	19 - 41
1" x No. 4	3/4"	52 - 85
1" x No. 4	3/8"	15 - 38
1/2" x No. 4	3/8"	40 - 78
3/8" x No. 8	3/8"	50 - 85
Fine Aggregate	No. 16	55 - 75
Fine Aggregate	No. 30	34 - 46
Fine Aggregate	No. 50	16 - 29

Should the Contractor change the source of supply, the Contractor shall submit in writing to the Engineer the new gradations before their intended use.

90-3.02 COARSE AGGREGATE GRADING

The grading requirements for coarse aggregates are shown in the following table for each size of coarse aggregate:

	Percentage Passing Primary Aggregate Nominal Sizes							
	1-1/2" x 3/4"		1" x No. 4		1/2" x No. 4		3/8" x No. 8	
Sieve Sizes	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance
2"	100	100	—	—	—	—	—	—
1-1/2"	88 - 100	85 - 100	100	100	—	—	—	—
1"	X ±18	X ±25	88 - 100	86 - 100	—	—	—	—
3/4"	0 - 17	0 - 20	X ±15	X ±22	100	100	—	—
1/2"	—	—	—	—	82 - 100	80 - 100	100	100
3/8"	0 - 7	0 - 9	X ±15	X ±22	X ±15	X ±22	X ±15	X ±20
No. 4	—	—	0 - 16	0 - 18	0 - 15	0 - 18	0 - 25	0 - 28
No. 8	—	—	0 - 6	0 - 7	0 - 6	0 - 7	0 - 6	0 - 7

In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

Coarse aggregate for the 1-1/2 inch, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," shall be furnished in 2 or more primary aggregate nominal sizes. Each primary aggregate nominal size may be separated into 2 sizes and stored separately, provided that the combined material conforms to the grading requirements for that particular primary aggregate nominal size.

When the one inch, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," is to be used, the coarse aggregate may be separated into 2 sizes and stored separately, provided that the combined material shall conform to the grading requirements for the 1" x No. 4 primary aggregate nominal size.

90-3.03 FINE AGGREGATE GRADING

Fine aggregate shall be graded within the following limits:

Sieve Sizes	Percentage Passing	
	Operating Range	Contract Compliance
3/8"	100	100
No. 4	95 - 100	93 - 100
No. 8	65 - 95	61 - 99
No. 16	X ±10	X ±13
No. 30	X ±9	X ±12
No. 50	X ±6	X ±9
No. 100	2 - 12	1 - 15
No. 200	0 - 8	0 - 10

In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the No. 16 sieve and the total percentage passing the No. 30 sieve shall be between 10 and 40, and the difference between the percentage passing the No. 30 and No. 50 sieves shall be between 10 and 40.

Fine aggregate may be separated into 2 or more sizes and stored separately, provided that the combined material conforms to the grading requirements specified in this Section 90-3.03.

90-3.04 COMBINED AGGREGATE GRADINGS

Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined aggregates as specified herein.

The combined aggregate grading, except when otherwise specified in these specifications or the special provisions, shall be either the 1-1/2 inch, maximum grading, or the 1 inch, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

Sieve Sizes	Percentage Passing			
	1-1/2" Max.	1" Max.	1/2" Max.	3/8" Max.
2"	100	—	—	—
1-1/2"	90 - 100	100	—	—
1"	50 - 86	90 - 100	—	—
3/4"	45 - 75	55 - 100	100	—
1/2"	—	—	90 - 100	100
3/8"	38 - 55	45 - 75	55 - 86	50 - 100
No. 4	30 - 45	35 - 60	45 - 63	45 - 63
No. 8	23 - 38	27 - 45	35 - 49	35 - 49
No. 16	17 - 33	20 - 35	25 - 37	25 - 37
No. 30	10 - 22	12 - 25	15 - 25	15 - 25
No. 50	4 - 10	5 - 15	5 - 15	5 - 15
No. 100	1 - 6	1 - 8	1 - 8	1 - 8
No. 200	0 - 3	0 - 4	0 - 4	0 - 4

Changes from one grading to another shall not be made during the progress of the work unless permitted by the Engineer.

90-4 ADMIXTURES

90-4.01 GENERAL

Admixtures used in portland cement concrete shall conform to and be used in conformance with the provisions in this Section 90-4 and the special provisions. Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option as provided herein.

Chemical admixtures and air-entraining admixtures containing chlorides as Cl in excess of one percent by weight of admixture, as determined by California Test 415, shall not be used.

Admixtures shall be uniform in properties throughout their use in the work. Should it be found that an admixture as furnished is not uniform in properties, its use shall be discontinued.

If more than one admixture is used, the admixtures shall be compatible with each other so that the desirable effects of all admixtures used will be realized.

Chemical admixtures shall be used in conformance with the manufacturer's written recommendations. The manufacturer's written recommendations shall include a statement that the admixtures are compatible with the types and amounts of SCMs used.

90-4.02 MATERIALS

Admixture materials shall conform to the provisions in Section 90-2.04, "Admixture Materials."

90-4.03 ADMIXTURE APPROVAL

No admixture brand shall be used in the work unless it is on the Department's current list of approved brands for the type of admixture involved. Information regarding admixture qualification and placement on the Department's list can be obtained at the Transportation Laboratory.

If the Contractor proposes to use an admixture of a brand and type on the current list of approved admixture brands, the Contractor shall furnish a Certificate of Compliance from the manufacturer, as provided in Section 6-1.07, "Certificates of Compliance," certifying that the admixture furnished is the same as that previously approved. If a previously approved admixture is not accompanied by a Certificate of Compliance, the admixture shall not be used in the work until the Engineer has had sufficient time to make the appropriate tests and has approved the admixture for use. The Engineer may take samples for testing at any time, whether or not the admixture has been accompanied by a Certificate of Compliance.

90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES

If the use of a chemical admixture is specified, the admixture shall be used at the dosage specified, except that if no dosage is specified, the admixture shall be used at the dosage normally recommended by the manufacturer of the admixture.

90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES

The Contractor may use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:

A. If a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by weight, except that the resultant cementitious material content shall be not less than 505 pounds per cubic yard; and
B. When a reduction in cementitious material content is made, the dosage of admixture used shall be no less than the dosage used in determining approval of the admixture.

The Contractor may use Type S admixtures conforming to the requirements in ASTM Designation: C 494.

Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494, may be used in portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

90-4.06 REQUIRED USE OF AIR-ENTRAINING ADMIXTURES

When air-entrainment is specified or ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce a concrete having the specified air content as determined by California Test 504.

90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES

When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent, and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate.

90-4.08 BLANK

90-4.09 BLANK

90-4.10 PROPORTIONING AND DISPENSING LIQUID ADMIXTURES

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers for liquid admixtures shall have sufficient capacity to measure at one time the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which liquid admixtures are measured to within ±5 percent of the prescribed quantity for each batch. Dispensers shall be located and maintained so that the graduations can be accurately read from the point at which proportioning operations are controlled to permit a visual check of batching accuracy prior to discharge. Each measuring unit shall be clearly marked for the type and quantity of admixture.

Each liquid admixture dispensing system shall be equipped with a sampling device consisting of a valve located in a safe and readily accessible position such that a sample of the admixture may be withdrawn slowly by the Engineer.

If more than one liquid admixture is used in the concrete mix, each liquid admixture shall have a separate measuring unit and shall be dispensed by injecting equipment located in such a manner that the admixtures are not mixed at high concentrations and do not interfere with the effectiveness of each other. When air-entraining admixtures are used in conjunction with other liquid admixtures, the air-entraining admixture shall be the first to be incorporated into the mix, unless it is demonstrated that a different sequence improves performance.

When automatic proportioning devices are used, dispensers for liquid admixtures shall operate automatically with the batching control equipment. The dispensers shall be equipped with an automatic warning system in good operating condition that will provide a visible or audible signal at the point at which proportioning operations are controlled when the quantity of admixture measured for each batch of concrete varies from the preselected dosage by more than 5 percent, or when the entire contents of the measuring unit are not emptied from the dispenser into each batch of concrete.

Unless liquid admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow into the stream of water so that the admixtures are well dispersed throughout the batch, except that air-entraining admixtures may be dispensed directly into moist sand in the batching bins provided that adequate control of the air content of the concrete can be maintained.

Liquid admixtures requiring dosages greater than one-half gallon per cubic yard shall be considered to be water when determining the total amount of free water as specified in Section 90-6.06, "Amount of Water and Penetration."

90-4.11 BLANK

90-5 PROPORTIONING

90-5.01 STORAGE OF AGGREGATES

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size shall be avoided and the various sizes shall not become intermixed before proportioning.

Aggregates shall be stored or stockpiled and handled in a manner that prevent contamination by foreign materials. In addition, storage of aggregates at batching or mixing facilities that are erected subsequent to the award of the contract and that furnish concrete to the project shall conform to the following:

A. Intermingling of the different sizes of aggregates shall be positively prevented. The Contractor shall take the necessary measures to prevent intermingling. The preventive measures may include, but are not necessarily limited to, physical separation of stockpiles or construction of bulkheads of adequate length and height; and
B. Contamination of aggregates by contact with the ground shall be positively prevented. The Contractor shall take the necessary measures to prevent contamination. The preventive measures shall include, but are

not necessarily limited to, placing aggregates on wooden platforms or on hardened surfaces consisting of portland cement concrete, asphalt concrete, or cement treated material.

In placing aggregates in storage or in moving the aggregates from storage to the weigh hopper of the batching plant, any method that may cause segregation, degradation, or the combining of materials of different gradings that will result in any size of aggregate at the weigh hopper failing to meet the grading requirements, shall be discontinued. Any method of handling aggregates that results in excessive breakage of particles shall be discontinued. The use of suitable devices to reduce impact of falling aggregates may be required by the Engineer.

90-5.02 PROPORTIONING DEVICES

Weighing, measuring, or metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems shall comply with the requirements for automatic proportioning devices in Section 90-5.03A, "Automatic Proportioning." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and SCM for one batch of concrete is a single operation of a switch or starter.

For concrete pavement, aggregate and bulk cementitious material must be proportioned by weight by means of automatic proportioning devices.

Proportioning devices shall be tested as frequently as the Engineer may deem necessary to ensure their accuracy.

Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the weight of each batch of material shall not vary from the weight designated by the Engineer by more than the tolerances specified herein.

Equipment for cumulative weighing of aggregate shall have a zero tolerance of ±0.5 percent of the designated total batch weight of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance shall be ±0.5 percent of the individual batch weight designated for each size of aggregate. Equipment for cumulative weighing of cement and SCM shall have a zero tolerance of ±0.5 percent of the designated total batch weight of the cement and SCM. Equipment for weighing cement or SCM separately shall have a zero tolerance of ±0.5 percent of their designated individual batch weights. Equipment for measuring water shall have a zero tolerance of ±0.5 percent of its designated weight or volume.

The weight indicated for any batch of material shall not vary from the preselected scale setting by more than the following:

A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch weight of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch weights; and
B. Cement shall be 99 to 102 percent of its designated batch weight. When weighed individually, SCM shall be 99 to 102 percent of its designated batch weight. When SCM and cement are permitted to be weighed cumulatively, cement shall be weighed first to 99 to 102 percent of its designated batch weight, and the total for cement and SCM shall be 99 to 102 percent of the sum of their designated batch weights When a blended cement is used, the percentages of cement and SCM used for calculating batch weights shall be based on the percentage of SCM indicated in the Certificate of Compliance from the blended cement supplier; and
C. Water shall be within 1.5 percent of its designated weight or volume.

Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, SCM, or cement plus SCM and aggregates shall not exceed that of commercially available scales having single graduations indicating a weight not exceeding the maximum permissible weight variation above, except that no scale shall be required having a capacity of less than 1,000 pounds, with one pound graduations.

90-5.03 PROPORTIONING

Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cementitious material and water as provided in these specifications. Aggregates shall be proportioned by weight.

At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry weight.

Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

Bulk Type IP (MS) or Type IS (MS) cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

Bulk cement and SCM may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and SCM are weighed cumulatively, the cement shall be weighed first.

If cement and SCM are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the SCM shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material-weighing device. The cement and the SCM shall be discharged into the mixer simultaneously with the aggregate.

The scales and weigh hoppers for bulk weighing cement, SCM, or cement plus SCM shall be separate and distinct from the aggregate weighing equipment.

For batches of one cubic yard or more, the batching equipment shall conform to one of the following combinations:

A. Separate boxes and separate scale and indicator for weighing each size of aggregate.
B. Single box and scale indicator for all aggregates.
C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

In order to check the accuracy of batch weights, the gross weight and tare weight of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed on scales designated by the Engineer.

90-5.03A Automatic Proportioning

Automatic proportioning devices shall be authorized by the Department.

For concrete pavement, the Contractor shall install and maintain in operating condition an electronically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by weight of the fine aggregate.

The batching of cement, SCM, or cement plus SCM and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and SCM hoppers or the cement plus SCM hopper are charged with weights that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

If interlocks are required for cement and SCM charging mechanisms and cement and SCM are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of SCM until the weight of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."

If concrete is completely mixed in stationary mixers, the SCMs shall be weighed in a separate weigh hopper and the SCM and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the Contractor provides certification that the stationary mixer is capable of mixing the cement, SCM, aggregates, and water uniformly before discharge, weighing the SCM cumulatively with the cement is permitted. Certification shall contain the following:

A. Test results for 2 compressive strength test cylinders of concrete taken within the first one-third and 2 compressive strength test cylinders of concrete taken within the last one-third of the concrete discharged from a single batch from the stationary mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength";
B. Calculations demonstrating that the difference in the averages of 2 compressive strengths taken in the first one-third is no greater than 7.5 percent different than the averages of 2 compressive strengths taken in the last one-third of the concrete discharged from a single batch from the stationary mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;" and
C. The mixer rotation speed and time of mixing before discharge that are required to produce a mix that meets the requirements above.

The discharge gate on the cement and SCM hoppers or the cement plus SCM hopper shall be designed to permit regulating the flow of cement, SCM, or cement plus SCM into the aggregate as directed by the Engineer.

If separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.

Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and so that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.

If the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required weight is discharged into the weigh box, after which the gate shall automatically close and lock.

The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

90-6 MIXING AND TRANSPORTING

90-6.01 GENERAL

Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 1/3 cubic yard may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."

Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.

Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cementitious material.

Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.

When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 1/2 inch. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of 2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 170 pounds per cubic yard of concrete.

Average Slump	Maximum Permissible Difference
Less than 4"	1"
4" to 6"	1-1/2"
Greater than 6" to 9"	2"

The Contractor shall furnish samples of the freshly mixed concrete and provide satisfactory facilities for obtaining the samples.

90-6.02 MACHINE MIXING

Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation of hard concrete or mortar shall not be used.

The temperature of mixed concrete, immediately before placing, shall be not less than 50 °F or more than 90 °F. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 150 °F. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one-fourth of the specified mixing time. When concrete is delivered in a truck mixer, a portion of the mixing water may be withheld and, if allowed by the Engineer, may be added at the point of delivery as specified under Section 90-6.03, "Transporting Mixed Concrete."

Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.

Stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.

The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.

The size of batch shall not exceed the manufacturer's guaranteed capacity.

When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at job site batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.

Concrete shall be mixed and delivered to the job site by means of one of the following combinations of operations:

A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in nonagitating hauling equipment (central-mixed concrete).
B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
C. Mixed completely in a truck mixer (transit-mixed concrete).

Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.

Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.

When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed will be allowed for partial mixing in a central plant.

90-6.03 TRANSPORTING MIXED CONCRETE

Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in non-agitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."

Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

Bodies of nonagitating hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.

Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 75 °F.

No water in excess of that in the approved mix design shall be incorporated into the concrete. If approved by the Engineer, water withheld during batching may be added to the concrete at the delivery point in one operation before the discharge of more than 1/4 cubic yard. Equipment for supplying the water shall conform to Section 90-6.06, "Amount of Water and Penetration." When water is added at the point of delivery, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharged is commenced.

The rate of discharge of mixed concrete from a truck mixer or agitator shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

If a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cementitious materials to the aggregates. Under conditions contributing to quick stiffening of the concrete, or if the temperature of the concrete is 85 °F or above, the time allowed may be less than 1.5 hours. If an admixture is used to retard the set time, the temperature of the concrete shall not exceed 85 °F, the time limit shall be 2 hours, and the revolution limitation shall be 300.

If nonagitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cementitious materials to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 °F or above, the time between the introduction of cementitious materials to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete delivered at the job site shall be accompanied by a weighmaster certificate showing the mix identification number, nonrepeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time

the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale weights (pounds) for the ingredients batched. Theoretical or target batch weights shall not be used as a substitute for actual scale weights.

Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a CD or DVD. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.

The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch weights or measurements for a load of concrete provided that both certificates are imprinted with the same nonrepeating load number that is unique to the contract and delivered to the jobsite with the load.

Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

90-6.04 TIME OR AMOUNT OF MIXING

Mixing of concrete in stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.

The required mixing time, in stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.

The required mixing time in stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.

The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

When a high range water-reducing admixture is added to the concrete at the job site, the total number of revolutions shall not exceed 300.

90-6.05 HAND-MIXING

Hand-mixed concrete shall be made in batches of not more than 1/3 cubic yard and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than one foot in total depth. On this mixture shall be spread the dry cementitious materials and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

90-6.06 AMOUNT OF WATER AND PENETRATION

The amount of water used in concrete mixes shall be regulated so that the penetration of the concrete as determined by California Test 533 or the slump of the concrete as determined by ASTM Designation: C 143 is within the nominal values shown in the following table. When the penetration or slump of the concrete is found to exceed the nominal values listed, the mixture of subsequent batches shall be adjusted to reduce the penetration or slump to a value within the nominal range shown. Batches of concrete with a penetration or slump exceeding the maximum values listed shall not be used in the work. If Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 9 inches after the chemical admixtures are added.

Type of Work	Nominal		Maximum	
	Penetration (inches)	Slump (inches)	Penetration (inches)	Slump (inches)
Concrete Pavement	0 - 1	—	1-1/2	—
Non-reinforced concrete facilities	0 – 1-1/2	—	2	—
Reinforced concrete structures				
Sections over 12 inches thick	0 – 1-1/2	—	2-1/2	—
Sections 12 inches thick or less	0 - 2	—	3	—
Concrete placed under water	—	6 - 8	—	9
Cast-in-place concrete piles	2-1/2 – 3-1/2	5 - 7	4	8

The amount of free water used in concrete shall not exceed 310 pounds per cubic yard, plus 20 pounds for each required 100 pounds of cementitious material in excess of 550 pounds per cubic yard.

The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.

If there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic yard of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 pounds of water per added 100 pounds of cementitious material per cubic yard. Full compensation for additional cementitious material and water added under these conditions shall be considered as included in the contract price paid for the concrete work involved and no additional compensation will be allowed therefor.

The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

90-7 CURING CONCRETE

90-7.01 METHODS OF CURING

Newly placed concrete shall be cured by the methods specified in this Section 90-7.01 and the special provisions.

90-7.01A Water Method

The concrete shall be kept continuously wet by the application of water for a minimum curing period of 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or earth or sand blankets may be used as a curing medium to retain the moisture during the curing period.

If a curing medium consisting of cotton mats, rugs, carpets, polyethylene sheeting, polyethylene sheeting on burlap, or earth or sand blankets is to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing media.

At the option of the Contractor, a curing medium consisting of white opaque polyethylene sheeting extruded onto burlap may be used to cure concrete structures. The polyethylene sheeting shall have a minimum thickness of 4-mil, and shall be extruded onto 10-ounce burlap.

At the option of the Contractor, a curing medium consisting of polyethylene sheeting may be used to cure concrete columns. The polyethylene sheeting shall have a minimum thickness of 10-mil achieved in a single layer of material.

If the Contractor chooses to use polyethylene sheeting or polyethylene sheeting on burlap as a curing medium, these media and any joints therein shall be secured as necessary to provide moisture retention and shall be within 3 inches of the concrete at all points along the surface being cured. When these media are used, the temperature of the concrete shall be monitored during curing. If the temperature of the concrete cannot be maintained below 140° F, use of these curing media shall be disallowed.

When concrete bridge decks and flat slabs are to be cured without the use of a curing medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified above, until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than 7 days.

90-7.01B Curing Compound Method

Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.

Curing compounds to be used shall be as follows:

1. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.

2. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
3. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
4. Nonpigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
5. Nonpigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
6. Nonpigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.

The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.28 pounds per square yard in 24 hours.

The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.

If the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.

Curing compound shall be applied at a nominal rate of one gallon per 150 square feet, unless otherwise specified.

At any point, the application rate shall be within ±50 square feet per gallon of the nominal rate specified, and the average application rate shall be within ±25 square feet per gallon of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.

Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.

The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.

At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.

Agitation shall not introduce air or other foreign substance into the curing compound.

The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.

Curing compounds shall remain sprayable at temperatures above 40 °F and shall not be diluted or altered after manufacture.

The curing compound shall be packaged in clean 274-gallon totes, 55-gallon barrels or 5-gallon pails shall be supplied from a suitable storage tank located at the jobsite. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 274-gallon totes and the 55-gallon barrels shall have removable lids and airtight fasteners. The 5-gallon pails shall be round and have standard full open head and bail. Lids with bungholes will not be permitted. Settling or separation of solids in containers, except tanks, must be completely redispersed with low speed mixing prior to use, in conformance with these specifications and the manufacturer's recommendations. Mixing shall be accomplished either manually by use of a paddle or by use of a mixing blade driven by a drill motor, at low speed. Mixing blades shall be the type used for mixing paint. On-site storage tanks shall be kept clean and free of contaminants. Each tank shall have a permanent system designed to completely redisperse settled material without introducing air or other foreign substances.

Steel containers and lids shall be lined with a coating that will prevent destructive action by the compound or chemical agents in the air space above the compound. The coating shall not come off the container or lid as skins. Containers shall be filled in a manner that will prevent skinning. Plastic containers shall not react with the compound.

Each container shall be labeled with the manufacturer's name, kind of curing compound, batch number, volume, date of manufacture, and volatile organic compound (VOC) content. The label shall also warn that the curing compound containing pigment shall be well stirred before use. Precautions concerning the handling and the application of curing compound shall be shown on the label of the curing compound containers in conformance with the Construction Safety Orders and General Industry Safety Orders of the State.

Containers of curing compound shall be labeled to indicate that the contents fully comply with the rules and regulations concerning air pollution control in the State.

When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels.

Curing compound will be sampled by the Engineer at the source of supply, at the job site, or at both locations.

Curing compound shall be formulated so as to maintain the specified properties for a minimum of one year. The Engineer may require additional testing before use to determine compliance with these specifications if the compound has not been used within one year or whenever the Engineer has reason to believe the compound is no longer satisfactory.

Tests will be conducted in conformance with the latest ASTM test methods and methods in use by the Transportation Laboratory.

90-7.01C Waterproof Membrane Method

The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the curing membrane, shall be placed. The curing membrane shall remain in place for a period of not less than 72 hours.

Sheeting material for curing concrete shall conform to the requirements in AASHTO Designation: M 171 for white reflective materials.

The sheeting material shall be fabricated into sheets of such width as to provide a complete cover for the entire concrete surface. Joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have a minimum lap of 0.33 foot.

The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.

Should any portion of the sheets be broken or damaged before the expiration of 72 hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.

Sections of membrane that have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

90-7.01D Forms-In-Place Method

Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of 7 days after the concrete has been placed, except that for members over 20 inches in least dimension the forms shall remain in place for a minimum period of 5 days.

Joints in the forms and the joints between the end of forms and concrete shall be kept moisture tight during the curing period. Cracks in the forms and cracks between the forms and the concrete shall be resealed by methods subject to the approval of the Engineer.

90-7.02 BLANK

90-7.03 CURING STRUCTURES

Newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by the water method, the forms-in-place method, or, as permitted herein, by the curing compound method, in conformance with the provisions in Section 90-7.01, "Methods of Curing."

The curing compound method using a pigmented curing compound may be used on concrete surfaces of construction joints, surfaces that are to be buried underground, and surfaces where only ordinary surface finish is to be applied and on which a uniform color is not required and that will not be visible from a public traveled way. If the Contractor elects to use the curing compound method on the bottom slab of box girder spans, the curing compound shall be curing compound (1).

The top surface of highway bridge decks shall be cured by both the curing compound method and the water method. The curing compound shall be curing compound (1).

Concrete surfaces of minor structures, as defined in Section 51-1.02, "Minor Structures," shall be cured by the water method, the forms-in-place method or the curing compound method.

When deemed necessary by the Engineer during periods of hot weather, water shall be applied to concrete surfaces being cured by the curing compound method or by the forms-in-place method, until the Engineer determines that a cooling effect is no longer required. Application of water for this purpose will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

90-7.04 CURING PRECAST CONCRETE MEMBERS

Precast concrete members shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing." Curing shall be provided for the minimum time specified for each method or until the concrete reaches its design strength, whichever is less. Steam curing may also be used for precast members and shall conform to the following provisions:

A. After placement of the concrete, members shall be held for a minimum 4-hour presteaming period. If the ambient air temperature is below 50 °F, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 50 °F and 90 °F.
B. To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered as soon as possible after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.
C. Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture.
D. Steam at the jets shall be at low pressure and in a saturated condition. Steam jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall not exceed 40 °F per hour. The curing temperature throughout the enclosure shall not exceed 150 °F and shall be maintained at a constant level for a sufficient time necessary to develop the required transfer strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.
E. Temperature recording devices that will provide an accurate, continuous, permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per 200 feet of continuous bed length will be required for checking temperature.
F. Members in pretension beds shall be detensioned immediately after the termination of steam curing while the concrete and forms are still warm, or the temperature under the enclosure shall be maintained above 60 °F until the stress is transferred to the concrete.
G. Curing of precast concrete will be considered completed after termination of the steam curing cycle.

90-7.05 CURING PRECAST PRESTRESSED CONCRETE PILES

Newly placed concrete for precast prestressed concrete piles shall be cured in conformance with the provisions in Section 90-7.04, "Curing Precast Concrete Members," except that piles in a corrosive environment shall be cured as follows:

A. Piles shall be either steam cured or water cured. If water curing is used, the piles shall be kept continuously wet by the application of water in conformance with the provisions in Section 90-7.01A, "Water Method."
B. If steam curing is used, the steam curing provisions in Section 90-7.04, "Curing Precast Concrete Members," shall apply except that the piles shall be kept continuously wet for their entire length for a period of not less than 3 days, including the holding and steam curing periods.

90-7.06 CURING SLOPE PROTECTION

Concrete slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

Concreted-rock slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing," with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water every 2 hours during the daytime for a period of 3 days.

90-7.07 CURING MISCELLANEOUS CONCRETE WORK

Exposed surfaces of curbs shall be cured by pigmented curing compounds as specified in Section 90-7.01B, "Curing Compound Method."

Concrete sidewalks, gutter depressions, island paving, curb ramps, driveways, and other miscellaneous concrete areas shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

Shotcrete shall be cured for at least 72 hours by spraying with water, by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

Mortar and grout shall be cured by keeping the surface damp for 3 days.

After placing, the exposed surfaces of sign structure foundations, including pedestal portions, if constructed, shall be cured for at least 72 hours by spraying with water, by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

90-8 PROTECTING CONCRETE

90-8.01 GENERAL

In addition to the provisions in Section 7-1.16, "Contractor's Responsibility for the Work and Materials," the Contractor shall protect concrete as provided in this Section 90-8. If required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

The Contractor shall protect concrete from damage from any cause, which shall include, but not be limited to: rain, heat, cold, wind, Contractor's actions, and actions of others.

Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.

Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.

Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at the Contractor's expense.

90-8.02 PROTECTING CONCRETE STRUCTURES

Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 45 °F for 72 hours after placing and at not less than 40 °F for an additional 4 days.

90-9 COMPRESSIVE STRENGTH

90-9.01 GENERAL

Concrete compressive strength requirements consist of a minimum strength that shall be attained before various loads or stresses are applied to the concrete and, for concrete designated by compressive strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or the special provisions or are shown on the plans.

The compressive strength of concrete will be determined from test cylinders that have been fabricated from concrete sampled in conformance with the requirements of California Test 539. Test cylinders will be molded and initially field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with the requirements of California Test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.

When concrete is designated by compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State $10 for each in-place cubic yard of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State $15 for each in-place cubic yard of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete

represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."

If the test result indicates that the compressive strength at the maximum age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work is at least 85 percent of the specified strength. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.

No single compressive strength test shall represent more than 320 cubic yards.

If a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. If the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.

When concrete has a specified 28-day compressive strength greater than 3,600 pounds per square inch or when prequalification is specified, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.

Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.

Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 600 pounds per square inch greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.

Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.

The certified test data and trial batch test reports shall include the following information:

A. Date of mixing.
B. Mixing equipment and procedures used.
C. The size of batch in cubic yards and the weight, type, and source of all ingredients used.
D. Penetration or slump (if the concrete will be placed under water or placed in cast-in-place concrete piles) of the concrete.
E. The air content of the concrete if an air-entraining admixture is used.
F. The age at time of testing and strength of all concrete cylinders tested.

Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.

When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type of concrete required at that location.

After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.

The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.

When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

90-10 MINOR CONCRETE

90-10.01 GENERAL

Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.

The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

Before using minor concrete or in advance of revising the mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design. When required by the following table, the Contractor shall include compressive strength test results verifying the minimum specified compressive strength:

SCM	Test Submittal Required
Fly Ash used alone	When portland cement content<350 lbs/cy
GGBFS used alone	When portland cement content <250 lbs/cy
Natural Pozzolan used alone	When portland cement content <350 lbs/cy
More than 1 SCM	Always

Tests shall be performed by an ACI certified technician.

90-10.02 MATERIALS

Minor concrete shall conform to the following requirements:

90-10.02A Cementitious Material

Cementitious material shall conform to the provisions in Section 90-1.01, "Description," and 90-2, "Materials."

90-10.02B Aggregate

Aggregate shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.

Use of crushed concrete or reclaimed aggregate is acceptable only if the aggregate satisfies all aggregate requirements.

The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the minor concrete. After acceptance of the grading, aggregate furnished for minor concrete shall conform to that grading, unless a change is authorized in writing by the Engineer.

The Engineer may require the Contractor to furnish periodic test reports of the aggregate grading furnished. The maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 1-1/2-inch or smaller than 3/4 inch.

The Engineer may waive, in writing, the gradation requirements in this Section 90-10.02B, if, in the Engineer's opinion, the furnishing of the gradation is not necessary for the type or amount of concrete work to be constructed.

90-10.02C Water

Water used for washing, mixing, and curing shall be free from oil, salts, and other impurities that would discolor or etch the surface or have an adverse affect on the quality of the concrete.

90-10.02D Admixtures

The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures."

90-10.03 PRODUCTION

Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized standards of good practice are outlined in various industry publications such as are issued by American Concrete Institute, AASHTO, or the Department.

The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."

The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless allowed by the Engineer.

Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in non-agitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 90 °F will be considered conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.

The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.

The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.

When a high range water-reducing admixture is added to the concrete at the job site, the total number of revolutions shall not exceed 300.

Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

90-10.04 CURING MINOR CONCRETE

Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

90-10.05 PROTECTING MINOR CONCRETE

Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 40 °F for 72 hours after placing.

90-10.06 MEASUREMENT AND PAYMENT

Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

90-11 MEASUREMENT AND PAYMENT

90-11.01 MEASUREMENT

Portland cement concrete will be measured in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.

For concrete measured at the mixer, the volume in cubic feet shall be computed as the total weight of the batch in pounds divided by the density of the concrete in pounds per cubic foot. The total weight of the batch shall be calculated as the sum of all materials, including water, entering the batch. The density of the concrete will be determined in conformance with the requirements in California Test 518.

90-11.02 PAYMENT

Portland cement concrete will be paid for in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.

Full compensation for furnishing and incorporating admixtures required by these specifications or the special provisions will be considered as included in the contract prices paid for the concrete involved and no additional compensation will be allowed therefor.

Should the Engineer order the Contractor to incorporate any admixtures in the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor's benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

^^

SECTION 91 PAINT
(Issued 05-1-06)

Replace Section 91-3 with:

91-3 PAINTS FOR TIMBER

91-3.01 WOOD PRIMER, LATEX-BASE

Classification:

This specification covers a ready-mixed priming paint for use on unpainted wood or exterior woodwork. It shall conform with the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for exterior wood primers, and be listed on the Exterior Latex Wood Primer MPI List Number 6.

91-3.02 PAINT; LATEX-BASE FOR EXTERIOR WOOD, WHITE AND TINTS

Classification:

This specification covers a ready-mixed paint for use on wood surfaces subject to outside exposures. This paint shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for Paint, Latex, Exterior, and shall be listed on the following MPI Approved Products List:

A. Exterior Latex, Flat MPI Gloss Level 1, MPI List Number 10.
B. Exterior Latex, Semi-Gloss, MPI Gloss Level 5, MPI List Number 11.
C. Exterior Latex, Gloss, MPI Gloss Level 6, MPI List Number 119.

Unpainted wood shall first be primed with wood primer conforming to the provisions in Section 91-3.01, "Wood Primer, Latex-Base."

Replace Section 91-4 with:

91-4 MISCELLANEOUS PAINTS

91-4.01 THROUGH 91-4.04 (BLANK)

91-4.05 PAINT; ACRYLIC EMULSION, EXTERIOR WHITE AND LIGHT AND MEDIUM TINTS

Classification:

This specification covers an acrylic emulsion paint designed for use on exterior masonry. This paint shall conform to the requirements in the Detailed Performance Standards of the Master Painters Institute (MPI) for Paint, Latex, Exterior, and shall be listed on the following MPI Approved Products Lists:

A. Exterior Latex, Flat MPI Gloss Level 1, MPI List Number 10.
B. Exterior Latex, Semi-Gloss, MPI Gloss Level 5, MPI List Number 11.
C. Exterior Latex, Gloss, MPI Gloss Level 6, MPI List Number 119.

This paint may be tinted by using "universal" or "all purpose" concentrates.

^^

SECTION 92 ASPHALTS
(Issued 01-20-12)

Replace Section 92 with:

SECTION 92 ASPHALTS

92-1.01 DESCRIPTION

Asphalt is refined petroleum or a mixture of refined liquid asphalt and refined solid asphalt that are prepared from crude petroleum. Asphalt is:

1. Free from residues caused by the artificial distillation of coal, coal tar, or paraffin
2. Free from water
3. Homogeneous

92-1.02 MATERIALS

GENERAL

Furnish asphalt under the Department's "Certification Program for Suppliers of Asphalt." The Department maintains the program requirements, procedures, and a list of approved suppliers at:

http://www.dot.ca.gov/hq/esc/Translab/fpm/fpmcoc.htm

Transport, store, use, and dispose of asphalt safely.

Prevent the formation of carbonized particles caused by overheating asphalt during manufacturing or construction.

GRADES

Performance graded (PG) asphalt binder is:

Performance Graded Asphalt Binder

Property	AASHTO Test Method	Specification Grade				
		PG 58-22 [a]	PG 64-10	PG 64-16	PG 64-28	PG 70-10
Original Binder						
Flash Point, Minimum °C	T 48	230	230	230	230	230
Solubility, Minimum % [b]	T 44	99	99	99	99	99
Viscosity at 135°C, [c]	T 316					
Maximum, Pa·s		3.0	3.0	3.0	3.0	3.0
Dynamic Shear,	T 315					
Test Temp. at 10 rad/s, °C		58	64	64	64	70
Minimum G*/sin(delta), kPa		1.00	1.00	1.00	1.00	1.00
Maximum G*/sin(delta), kPa		2.00	2.00	2.00	2.00	2.00
RTFO Test, [e]	T 240					
Mass Loss, Maximum, %		1.00	1.00	1.00	1.00	1.00
RTFO Test Aged Binder						
Dynamic Shear,	T 315					
Test Temp. at 10 rad/s, °C		58	64	64	64	70
Minimum G*/sin(delta), kPa		2.20	2.20	2.20	2.20	2.20
Ductility at 25°C	T 51					
Minimum, cm		75	75	75	75	75
PAV [f] Aging,	R 28					
Temperature, °C		100	100	100	100	110
RTFO Test and PAV Aged Binder						
Dynamic Shear,	T 315					
Test Temp. at 10 rad/s, °C		22 [d]	31 [d]	28 [d]	22 [d]	34 [d]
Maximum G*sin(delta), kPa		5000	5000	5000	5000	5000
Creep Stiffness,	T 313					
Test Temperature, °C		-12	0	-6	-18	0
Maximum S-value, Mpa		300	300	300	300	300
Minimum M-value		0.300	0.300	0.300	0.300	0.300

Notes:

a. Use as asphalt rubber base stock for high mountain and high desert area.

b. The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt."

c. The Engineer waives this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.

d. Test the sample at 3°C higher if it fails at the specified test temperature. G*sin(delta) remains 5000 kPa maximum.

e. "RTFO Test" means the asphaltic residue obtained using the Rolling Thin Film Oven Test, AASHTO Test Method T 240 or ASTM Designation: D 2872. The residue from mass change determination may be used for other tests.

f. "PAV" means Pressurized Aging Vessel.

Performance graded polymer modified asphalt binder (PG Polymer Modified) is:

Performance Graded Polymer Modified Asphalt Binder [a]

Property	AASHTO Test Method	Specification Grade		
		PG 58-34 PM	PG 64-28 PM	PG 76-22 PM
Original Binder				
Flash Point, Minimum °C	T 48	230	230	230
Solubility, Minimum % [b]	T 44[c]	98.5	98.5	98.5
Viscosity at 135°C, [d] Maximum, Pa·s	T 316	3.0	3.0	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 1.00	64 1.00	76 1.00
RTFO Test , Mass Loss, Maximum, %	T 240	1.00	1.00	1.00
RTFO Test Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 2.20	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	Note e 80
Elastic Recovery[f], Test Temp., °C Minimum recovery, %	T 301	25 75	25 75	25 65
PAV[g] Aging, Temperature, °C	R 28	100	100	110
RTFO Test and PAV Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*sin(delta), kPa	T 315	16 5000	22 5000	31 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, MPa Minimum M-value	T 313	-24 300 0.300	-18 300 0.300	-12 300 0.300

Notes:

a. Do not modify PG Polymer Modified using acid modification.

b. The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt."

c. The Department allows ASTM D 5546 instead of AASHTO T 44

d. The Engineer waives this specification if the supplier certifies the asphalt binder 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.

SAMPLING

Provide a sampling device in the asphalt feed line connecting the plant storage tanks to the asphalt weighing system or spray bar. Make the sampling device accessible between 24 and 30 inches above the platform. Provide a receptacle for flushing the sampling device.

Include with the sampling device a valve:

1. Between 1/2 and 3/4 inch in diameter

2. Manufactured in a manner that a one-quart sample may be taken slowly at any time during plant operations
3. Maintained in good condition

Replace failed valves.

In the Engineer's presence, take 2 one-quart samples per operating day. Provide round, friction top, one-quart containers for storing samples.

92-1.03 EXECUTION

If asphalt is applied, you must comply with the heating and application specifications for liquid asphalt in Section 93, "Liquid Asphalts."

92-1.04 MEASUREMENT

If the contract work item for asphalt is paid by weight, the Department measures asphalt tons by complying with the specifications for weight determination of liquid asphalt in Section 93, "Liquid Asphalts."

The Engineer determines the asphalt weight from volumetric measurements if you:

1. Use a partial asphalt load
2. Use asphalt at a location other than a mixing plant and no scales within 20 miles are available and suitable
3. Deliver asphalt in either of the following:

    3.1. A calibrated truck with each tank accompanied by its measuring stick and calibration card
    3.2. A truck equipped with a calibrated thermometer that determines the asphalt temperature at the delivery time and with a vehicle tank meter complying with the specifications for weighing, measuring, and metering devices in Section 9-1.01, "Measurement of Quantities"

If you furnish hot mix asphalt from a mixing plant producing material for only one project, the Engineer determines the asphalt quantity by measuring the volume in the tank at the project's start and end provided the tank is calibrated and equipped with its measuring stick and calibration card.

The Engineer determines pay quantities from volumetric measurements as follows:

1. Before converting the volume to weight, the Engineer reduces the measured volume to that which the asphalt would occupy at 60 °F.
2. The Engineer uses 235 gallons per ton and 8.51 pounds per gallon for the average weight and volume for PG and PG Polymer Modified asphalt grades at 60 °F.
3. The Engineer uses the Conversion Table in Section 93, "Liquid Asphalts."

^^

SECTION 93 LIQUID ASPHALTS
(Issued 11-03-06)

In Section 93-1.04 replace the 9th paragraph with:

The following Legend and Conversion Table is to be used for converting volumes of liquid asphalt products, Grades 70 to 3000, inclusive, and paving asphalt Grades PG 58-22, PG 64-10, PG 64-16, PG 64-28, and PG 70-10, and Grades PG 58-34 PM, PG 64-28 PM, and PG 76-22 PM.

^^

SECTION 95 EPOXY
(Issued 06-05-09)

Replace the table in Section 95-2.11 with:

Characteristics of Adhesive:

Test[a]	California Test	Requirement
Brookfield Viscosity, No. 3 Spindle at 20 rpm, Poise at 77°F	434, Part 4	0.9 max.
Gel time, minutes	434, Part 1	2 to 15
Slant Shear Strength on Dry Concrete, psi, after 4 days of cure in air at 77° F ±2° F	434, Part 5[b]	3,000 min.
Slant Shear Strength on Wet Concrete, psi, after 4 days of cure in air at 77° F ±2° F	434, Part 5[b]	1,700 min.
Tensile Strength, psi	434, Part 7, except test after 4 days of cure at 77° F ±2° F	4,500 min.
Elongation, %	434, Part 7, except test after 4 days of cure at 77° F ±2° F	10 max.

[a] The mixing ratio used will be that recommended by the manufacturer.
[b] For slant shear strength on concrete, delete Sections B-1 and B-5 of California Test 434, Part 5. For dry concrete, use Step "2" below only. For wet concrete, use both Steps "1" & "2":

1. Soak blocks in water for 24 hours at 77° F ±2° F. Remove and wipe off excess water.
2. Mix epoxy as described in California Test 434, Part 1, and apply a coat approximately 0.010-inch thick to each diagonal surface. Place four 0.125-inch square pieces of shim stock 0.012-inch thick on one block to control final film thickness. Before pressing the coated surfaces together, leave the blocks so that the coated surfaces are horizontal until the epoxy reacts slightly to prevent excessive flow.