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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO CONTRACTORS
AND
SPECIAL PROVISIONS**

**FOR CONSTRUCTION ON STATE HIGHWAY IN
SAN DIEGO COUNTY IN SAN DIEGO FROM 0.1 KM SOUTH OF ROUTE 52/15 SEPARATION TO CARROLL
CANYON ROAD OVERCROSSING**

DISTRICT 11, ROUTE 15

**For Use in Connection with Standard Specifications Dated JULY 1999, Standard Plans Dated JULY 2004 and Labor
Surcharge and Equipment Rental Rates.**

**CONTRACT NO. 11-2T0914
DESIGN SEQUENCING CONTRACT
11-SD-15-R16.9/M24.1**

Bids Open: May 1, 2008

Dated: March 3, 2008

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IMPORTANT SPECIAL NOTICES

This project includes, but is not limited to, the following special requirements:

- Attention is directed to Section 2, "Proposal Requirements and Conditions" of these special provisions, for new requirements concerning a "DVBE Incentive Evaluation" and a "Small Business Enterprise Goal."
- Attention is directed to Section 3, "Pre-Award Review and Award and Execution of Contract" of these special provisions, for new requirement concerning a "A Small Business Participation Report."
- The anticipated period of time within which the contract may be awarded has been extended for this project. See Section 3, "Pre-Award Qualification Review and Award and Execution of Contract," of these Special Provisions.
- This project is part of a pilot program for "Design Sequencing", per Section 217, et seq., of the Streets and Highways Code (Assembly Bill 405). The purpose of the pilot program is to evaluate Design Sequencing as a tool for acceleration of project completion. Design Sequencing is a method of contracting where bids are based on partial project design, and final design activities are sequenced to permit each construction phase to commence when the design for that phase is complete, before the design of the entire project is complete. The project plans for this project are not considered complete to construct the work anticipated by the contract, and the Engineer's Estimate may contain anticipated items of work that are not indicated on the project plans. Design, and final project plans, will be completed during construction.
- Attention is directed to Section 1, "Specifications and Plans," and to "Progress Schedule (Critical Path Method) in these special provisions regarding additional requirements for Design Sequencing.
- Attention is directed to Section 2, "Proposal Requirements and Conditions," and Section 3, "Pre-Award Qualification Review and Award and Execution of Contract," in the special provisions regarding submittal of a pre-award qualification questionnaire and a pre-award review of the bidder's qualifications to perform the work of this project.
- The bidder's attention is directed to "Escrow of Bid Documentation," in Section 2, "Proposal Requirements and Conditions," of the special provisions.
- Attention is directed to Section 3-1.017, "Award and Execution of Contract," of these special provisions regarding submittal of the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications.
- Attention is directed to "Unexploded Ordnance" of these special provisions regarding potential temporary suspensions of work if unexploded ordnance is discovered on the project.
- Attention is directed to "United States Marine Corps Air Station Requirements" of these special provisions regarding work within the vicinity of United States Marine Corps Air Station airfield operations.

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STANDARD PLANS LIST

The Standard Plan sheets applicable to this contract include, but are not limited to those indicated below. The Revised Standard Plans (RSP) and New Standard Plans (NSP) which apply to this contract are included as individual sheets of the project plans.

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D74C	Drainage Inlets Details
D75B	Pipe Inlets
D75C	Pipe Inlets
D77A	Grate Details
D77B	Bicycle Proof Grate Details
D77C	Alternative Hinged Cover for Type OL and OS Inlets and Trash Rack for Type OCP Inlet
D82	Cast-In-Place Reinforced Concrete Box Culvert Miscellaneous Details
D87A	Corrugated Metal Pipe Downdrain Details
D87B	Plastic Pipe Downdrain Details
D87C	Cable Anchorage System
D88	Construction Loads on Culverts
D89	Pipe Headwalls
D93A	Pipe Riser Connections
D93B	Drainage Inlet Riser Connections
D93C	Pipe Riser with Debris Rack Cage
D94A	Metal and Plastic Flared End Sections
D94B	Concrete Flared End Sections
D97A	Corrugated Metal Pipe Coupling Details No. 1- Annular Coupling Band Bar And Strap and Angle Connections
D97B	Corrugated Metal Pipe Coupling Details No. 2- Hat Band Coupler and Flange Details
D97C	Corrugated Metal Pipe Coupling Details No. 3- Helical and Universal Couplers
D97D	Corrugated Metal Pipe Coupling Details No. 4- Hugger Coupling Bands
D97E	Corrugated Metal Pipe Coupling Details No. 5- Standard Joint
D97F	Corrugated Metal Pipe Coupling Details No. 6- Positive Joint
D97G	Corrugated Metal Pipe Coupling Details No. 7- Positive Joints and Downdrain
D97H	Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe-Standard and Positive Joints
D98A	Slotted Corrugated Steel Pipe Drain Details
D98C	Grated Line Drain Details
D99A	Structural Section Drainage System Details
D99B	Edge Drain Outlet and Vent Details
D99C	Edge Drain Cleanout and Vent Details
D99D	Cross Drain Interceptor Details
H1	Planting and Irrigation – Abbreviations
H2	Planting and Irrigation – Symbols
H7	Planting and Irrigation Details
NSP H51	Erosion Control Details (Fiber Roll)
T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
RSP T7	Construction Project Funding Identification Signs
RSP T10	Traffic Control System for Lane Closure on Freeways and Expressways
RSP T10A	Traffic Control System for Lane and Complete Closures on Freeways and Expressways
RSP T14	Traffic Control System for Ramp Closure
T54	Temporary Water Pollution Control Details (Temporary Erosion Control Blanket)
T55	Temporary Water Pollution Control Details (Temporary Erosion Control Blanket)
T56	Temporary Water Pollution Control Details (Temporary Fiber Roll)
T57	Temporary Water Pollution Control Details (Temporary Check Dam)
T58	Temporary Water Pollution Control Details (Temporary Construction Entrance)
T59	Temporary Water Pollution Control Details (Temporary Concrete Washout Facility)
B0-3	Bridge Details
B0-13	Bridge Details
B3-1	Retaining Wall Type 1 – H=1200 Through 9100 mm

B3-8	Retaining Wall Details No. 1
B3-9	Retaining Wall Details No. 2
B7-1	Box Girder Details
B7-6	Deck Drains – Types D-1 and D-2
B11-47	Cable Railing
B11-53	Concrete Barrier Type 25
B11-56	Concrete Barrier Type 736
RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
RS4	Roadside Signs, Typical Installation Details No. 4
RSP S30	Overhead Signs – Tubular, Instructions and Examples
RSP S31	Overhead Signs – Tubular, Single Post Type – Layout and Pipe Selection
RSP S32	Overhead Signs – Tubular, Two Post Type – Layout and Pipe Selection
RSP S33	Overhead Signs – Tubular, Structural Frame – Details No. 1
RSP S34	Overhead Signs – Tubular, Structural Frame – Details No. 2
RSP S35	Overhead Signs – Tubular, Single and Two Post Type – Base Plate and Anchorage Details
RSP S36	Overhead Signs – Tubular, Single Post and Two Post Type – Square Pedestal Pile Foundation
RSP S37	Overhead Signs – Tubular, Single Post and Two Post Type – Round Pedestal Pile Foundation
RSP S41	Overhead Signs – Lightweight Balanced – Single Steel Post Connection and Mounting Details
RSP S42	Overhead Signs – Lightweight Balanced – Single Steel Post Details
RSP S43	Overhead Signs – Lightweight, Type A, Connection Details
S46	Overhead Signs – Lightweight, Sign Panel Mounting Details, Laminated Panel – Type A
S47	Overhead Signs – Lightweight, Light Fixture Mounting Details
RSP S48	Overhead Signs – Lightweight Post Details
S49	Overhead Signs – Lightweight Foundation Details
S81	Overhead Laminated Sign – Single or Multiple Panel, Type A (25.4 mm 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
RSP S87	Type A –1 Mounting Hardware – Overhead Laminated Type A Panel, Truss and Lightweight Sign Structures
S88	Type A – 2 Mounting Hardware – Overhead Laminated Type A Panel, Box Beam Closed Truss, Bridge Mounted and Tubular Sign Structures
S93	Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape
S94	Roadside 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)
RSP ES-2A	Electrical Systems (Service Equipment)
RSP ES-2E	Electrical Systems (Service Equipment and Typical Wiring Diagram, Type III – B Series)
RSP ES-2F	Electrical Systems (Service Equipment and Typical Wiring Diagram Type III – C Series)
ES-4A	Electrical Systems (Signal Heads and Mountings)
ES-4C	Electrical Systems (Signal Heads and Mountings)
ES-4D	Electrical Systems (Signal Heads and Mountings)
ES-4E	Electrical Systems (Signal Faces and Mountings)
RSP ES-5A	Electrical Systems (Detectors)
ES-5B	Electrical Systems (Detectors)
RSP ES-5D	Electrical Systems (Detectors)
RSP ES-6A	Electrical Systems (Lighting Standard Types 15 and 21)
ES-6H	Electrical Systems (Lighting Standards Types 35 and 36-20A, 10 Degree Type)
ES-6I	Electrical Systems (Lighting Standards Types 35 and 36-20A, 10 Degree Type Details)
RSP ES-7A	Electrical Systems (Signal Standards Push Button Posts and Type 15TS Standard))
RSP ES-7B	Electrical Systems (Signal And Lighting Standard – Type 1 Standard and Equipment

	Numbering)
RSP ES-7M	Electrical Systems (Signal and Lighting Standards – Details No. 1)
ES-7N	Electrical Systems (Signal and Lighting Standards – Details No. 2)
RSP ES-8	Electrical Systems (Pull Box Details)
RSP ES-9A	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-9B	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-9C	Electrical Systems (Electrical Details, Structure Installations)
ES-9D	Electrical Systems (Electrical Details, Structure Installations)
RSP ES-10	Electrical Systems (Isolux Diagrams)
RSP ES-11	Electrical Systems (Foundation Installations)
RSP ES-13A	Electrical Systems (Splicing Details)
RSP ES-13B	Electrical Systems (Wiring Details and Fuse Ratings)
ES-15A	Electrical Systems (Sign Illumination Equipment)
RSP ES-15C	Electrical Systems (Sign Illumination Equipment)
RSP ES-15D	Electrical Systems (Lighting and Sign Illumination Control)
RSP ES-16A	Electrical Systems (Closed Circuit Television Pole Details)

DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

CONTRACT NO. 11-2T0914

11-SD-15-R16.9/M24.1

Sealed proposals for the work shown on the plans entitled:

STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY IN SAN DIEGO FROM 0.1 KM SOUTH OF ROUTE 52/15 SEPARATION TO CARROLL CANYON ROAD OVERCROSSING

will be received at the Department of Transportation, 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692, until 2 o'clock p.m. on May 1, 2008, at which time they will be publicly opened and read in Room C - 1116 at the same address.

Proposal forms for this work are included in a separate book entitled:

STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY IN SAN DIEGO FROM 0.1 KM SOUTH OF ROUTE 52/15 SEPARATION TO CARROLL CANYON ROAD OVERCROSSING

General work description: Construct Unit One of the Managed Lanes - South Segment

This project has a goal of 5 percent disabled veteran business enterprise (DVBE) participation.

No prebid meeting is scheduled for this project.

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or any combination of the following Class C licenses which constitutes a majority of the work: C-8, C-12.

The Contractor must also be properly licensed at the time the bid is submitted, except that on a joint venture bid a joint venture license may be obtained by a combination of licenses after bid opening but before award in conformance with Business and Professions Code, Section 7029.1.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

This project is subject to the State Small Business Preference, Non-Small Business Subcontractor Preference, and California Company Reciprocal Preference.

Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.

Bidder inquiries may be made as follows:

The Department will consider bidder inquiries only when a completed "Bidder Inquiry" form is submitted. A copy of the "Bidder Inquiry" form is available at the Internet address shown below. The bidder inquiry shall include the bidder's name and telephone number. Submit "Bidder Inquiry" forms to :

District 11 Construction Duty Senior
Location address: 4050 Taylor Street, San Diego, CA 92110

Fax Number: (619) 688-6988
E-mail: Duty_Senior_Const_District11@dot.ca.gov
Tel. Number: (619) 688-6635

To expedite processing, submittal of "Bidder Inquiry" forms via Fax or E-mail is preferred.

To the extent feasible and at the discretion of the Department, completed "Bidder Inquiry" forms submitted for consideration will be investigated, and responses will be posted on the Internet at:

<http://www.dot.ca.gov/dist11/construc/>

The responses to bidders' inquiries, unless incorporated into formal addenda to the contract, are not a part of the contract, and are provided for the bidder's convenience only. In some instances, the question and answer may represent a summary of the matters discussed rather than a word-for-word recitation. The availability or use of information provided in the responses to bidders' inquiries is not to be construed in any way as a waiver of the provisions of Section 2-1.03 of the Standard Specifications or any other provision of the contract, the plans, Standard Specifications or Special Provisions, nor to excuse the contractor from full compliance with those contract requirements. Bidders are cautioned that subsequent responses or contract addenda may affect or vary a response previously given.

Project plans, special provisions, and proposal forms for bidding this project can only be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, MS #26, Transportation Building, 1120 N Street, Sacramento, California 95814, FAX No. (916) 654-7028, Telephone No. (916) 654-4490. Use FAX orders to expedite orders for project plans, special provisions and proposal forms. FAX orders must include credit card charge number, card expiration date and authorizing signature. Project plans, special provisions, and proposal forms may be seen at the above Department of Transportation office and at the offices of the District Directors of Transportation at Irvine, Oakland, and the district in which the work is situated. Standard Specifications and Standard Plans are available through the State of California, Department of Transportation, Publications Unit, 1900 Royal Oaks Drive, Sacramento, CA 95815, Telephone No. (916) 445-3520.

The successful bidder shall furnish a payment bond and a performance bond.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' Internet Web Site at: <http://www.dir.ca.gov>. Future effective general prevailing wage rates which have been predetermined and are on file with the Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated March 3, 2008

JIK

**COPY OF ENGINEER'S ESTIMATE
(NOT TO BE USED FOR BIDDING PURPOSES)**

11-2T0914

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
2	070018	TIME-RELATED OVERHEAD	WDAY	600
3 (S)	013465	TEMPORARY CHAIN LINK GATE	EA	1
4	071325	TEMPORARY FENCE (TYPE ESA)	M	5900
5	074016	CONSTRUCTION SITE MANAGEMENT	LS	LUMP SUM
6 (S)	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
7 (S)	074051	TEMPORARY HYDRAULIC MULCH	M2	46 100
8	074028	TEMPORARY FIBER ROLL	M	28 000
9	074032	TEMPORARY CONCRETE WASHOUT FACILITY	EA	31
10	074033	TEMPORARY CONSTRUCTION ENTRANCE	EA	55
11	074035	TEMPORARY CHECK DAM	M	120
12 (S)	074037	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	EA	5
13	074038	TEMPORARY DRAINAGE INLET PROTECTION	EA	150
14 (S)	074040	TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)	M2	6600
15	074041	STREET SWEEPING	LS	LUMP SUM
16 (S)	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
17 (S)	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
18 (S)	120120	TYPE III BARRICADE	EA	20
19 (S)	013466	TYPE III BARRICADE (LEFT IN PLACE)	EA	8
20 (S)	120159	TEMPORARY TRAFFIC STRIPE (PAINT)	M	670

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21 (S)	120300	TEMPORARY PAVEMENT MARKER	EA	71
22 (S)	128650	PORTABLE CHANGEABLE MESSAGE SIGN	EA	15
23	129000	TEMPORARY RAILING (TYPE K)	M	38 900
24 (S)	013467	TRAFFIC PLASTIC DRUM (LEFT IN PLACE)	EA	160
25 (S)	013468	TRAFFIC PLASTIC DRUM	EA	610
26 (S)	129100	TEMPORARY CRASH CUSHION MODULE	EA	320
27 (S)	013469	CRASH CUSHION MODULE (LEFT IN PLACE)	EA	28
28 (S)	013470	TEMPORARY CRASH CUSHION (ABSORB 350)	EA	1
29	150206	ABANDON CULVERT	EA	46
30	150221	ABANDON INLET	EA	37
31	013471	ABANDON IRRIGATION CROSSOVER	EA	23
32	150608	REMOVE CHAIN LINK FENCE	M	840
33 (S)	150662	REMOVE METAL BEAM GUARD RAILING	M	910
34 (S)	013472	REMOVE DOUBLE THRIE BEAM BARRIER	M	1070
35 (S)	150710	REMOVE TRAFFIC STRIPE	M	80 000
36 (S)	150713	REMOVE PAVEMENT MARKING	M2	14
37 (S)	150742	REMOVE ROADSIDE SIGN	EA	26
38	150760	REMOVE SIGN STRUCTURE	EA	16
39	150771	REMOVE ASPHALT CONCRETE DIKE	M	9340
40	150844	REMOVE SLOPE PAVING	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	151224	REMOVE DELINEATOR	EA	70
42	152320	RESET ROADSIDE SIGN	EA	15
43 (S)	013473	RELOCATE HOV POP-UP CONTROL SYSTEM	LS	LUMP SUM
44	152390	RELOCATE ROADSIDE SIGN	EA	29
45	152394	RELOCATE SIGN STRUCTURE	EA	1
46	152438	ADJUST FRAME AND COVER TO GRADE	EA	4
47 (S)	153103	COLD PLANE ASPHALT CONCRETE PAVEMENT	M2	2010
48	013474	SALVAGE HOV TOLL BOOTH	LS	LUMP SUM
49	153216	REMOVE CONCRETE CURB AND SIDEWALK	M	410
50	153221	REMOVE CONCRETE BARRIER	M	8600
51	153229	REMOVE CONCRETE BARRIER (TYPE K)	M	48
52	153531	ACCESS OPENING, SOFFIT	EA	1
53	155003	CAP INLET	EA	16
54	155006	CAP RISER	EA	15
55	013475	REMOVE CRASH CUSHION (TYPE GREAT)	EA	6
56	013476	REMOVE CRASH CUSHION (SAND FILLED, MODULE)	EA	14
57	157561	BRIDGE REMOVAL (PORTION), LOCATION A	LS	LUMP SUM
58	157562	BRIDGE REMOVAL (PORTION), LOCATION B	LS	LUMP SUM
59	157563	BRIDGE REMOVAL (PORTION), LOCATION C	LS	LUMP SUM
60	157564	BRIDGE REMOVAL (PORTION), LOCATION D	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61	157565	BRIDGE REMOVAL (PORTION), LOCATION E	LS	LUMP SUM
62	160101	CLEARING AND GRUBBING	LS	LUMP SUM
63	170101	DEVELOP WATER SUPPLY	LS	LUMP SUM
64	190101	ROADWAY EXCAVATION	M3	153 000
65 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	M3	1100
66 (F)	192037	STRUCTURE EXCAVATION (RETAINING WALL)	M3	7467
67 (F)	192050	STRUCTURE EXCAVATION (TIEBACK WALL)	M3	865
68 (F)	192055	STRUCTURE EXCAVATION (SOIL NAIL WALL)	M3	155
69 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	270
70 (F)	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	12 419
71 (F)	193026	STRUCTURE BACKFILL (TIEBACK WALL)	M3	44
72 (F)	193028	STRUCTURE BACKFILL (SOIL NAIL WALL)	M3	15
73 (F)	193031	PERVIOUS BACKFILL MATERIAL (RETAINING WALL)	M3	1045
74	193114	SAND BACKFILL	M3	1210
75 (S)	197060	SOIL NAIL ASSEMBLY	M	745
76 (S)	013477	EROSION CONTROL (BIOFILTRATION)	M2	1040
77 (S)	203016	EROSION CONTROL (TYPE D)	M2	110 000
78 (S)	203017	EROSION CONTROL (HYDRAULIC MATRIX)	M2	7320
79	203021	FIBER ROLLS	M	510
80 (S)	203025	COMPOST, INCORPORATE	M2	7320

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81 (S)	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	5
82	013478	TRUCK WATERING	LS	LUMP SUM
83 (S)	208000	IRRIGATION SYSTEM	LS	LUMP SUM
84	208732	250 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	70
85	208910	EXTEND 250 MM CONDUIT	M	24
86	013479	EXTEND 500 MM CONDUIT	M	6
87	220101	FINISHING ROADWAY	LS	LUMP SUM
88	260201	CLASS 2 AGGREGATE BASE	M3	55 300
89	290201	ASPHALT TREATED PERMEABLE BASE	M3	4900
90	374002	ASPHALTIC EMULSION (FOG SEAL COAT)	TONN	18
91	390102	ASPHALT CONCRETE (TYPE A)	TONN	30 400
92	390108	ASPHALT CONCRETE BASE (TYPE A)	TONN	34 700
93	394001	PLACE ASPHALT CONCRETE DIKE	M	8500
94	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	1400
95	397001	ASPHALTIC EMULSION (PAINT BINDER)	TONN	0.5
96	401000	CONCRETE PAVEMENT	M3	27 900
97	404092	SEAL PAVEMENT JOINT	M	39 100
98	404094	SEAL LONGITUDINAL ISOLATION JOINT	M	15 800
99	413111	REPAIR SPALLED JOINTS	M2	10
100 (S)	420201	GRIND EXISTING CONCRETE PAVEMENT	M2	17 200

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
101 (S)	013480	1524 MM CAST-IN-DRILLED HOLE CONCRETE PILE	M	200
102 (S)	500001	PRESTRESSING CAST-IN-PLACE CONCRETE	LS	LUMP SUM
103 (S)	500050	TIEBACK ANCHOR	EA	203
104 (S)	041300	INCLINOMETER	LS	LUMP SUM
105 (F)	041301	STRUCTURAL CONCRETE, CIP WALL FACE	M3	330
106 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	325
107 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	970
108 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	M3	4399
109	510126	CLASS 2 CONCRETE (MINOR STRUCTURE)	M3	29
110	510314	CLASS 4 CONCRETE (BACKFILL)	M3	380
111 (F)	510413	CLASS 1 CONCRETE (BOX CULVERT)	M3	12
112 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	291.3
113	511036	ARCHITECTURAL SURFACE (BARRIER)	M2	600
114 (F)	041302	SWIRLED PLASTER TEXTURE	M2	5280
115	511106	DRILL AND BOND DOWEL	M	92
116 (S)	515072	CORE CONCRETE (0 - 50 MM)	M	37
117 (S-F)	041303	BAR REINFORCING STEEL (CIP WALL FACE)	KG	57 400
118 (S-F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	102 800
119 (S-F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	295 282
120 (S-F)	520107	BAR REINFORCING STEEL (BOX CULVERT)	KG	2300

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
121 (F)	530100	SHOTCRETE	M3	369
122 (F)	560208	FURNISH SIGN STRUCTURE (TUBULAR)	KG	200 484
123 (S-F)	560209	INSTALL SIGN STRUCTURE (TUBULAR)	KG	200 484
124	560234	FURNISH LAMINATED PANEL SIGN (25.4 MM-TYPE A)	M2	530
125	560238	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-UNFRAMED)	M2	31
126	560239	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-UNFRAMED)	M2	12
127	560241	FURNISH SINGLE SHEET ALUMINUM SIGN (1.6 MM-FRAMED)	M2	22
128	560242	FURNISH SINGLE SHEET ALUMINUM SIGN (2.0 MM-FRAMED)	M2	7
129	562004	METAL (RAIL MOUNTED SIGN)	KG	240
130	013481	ROADSIDE SIGN-ONE POST (WEED CONTROL MAT RUBBER)	EA	3
131	566011	ROADSIDE SIGN - ONE POST	EA	24
132	566012	ROADSIDE SIGN - TWO POST	EA	3
133	568001	INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	5
134	568007	INSTALL SIGN OVERLAY	M2	5.3
135	568017	INSTALL ROADSIDE SIGN PANEL ON EXISTING POST	EA	9
136	013482	INSTALL SIGN PANEL ON EXISTING SIGN STRUCTURE	M2	210
137	620909	450 MM ALTERNATIVE PIPE CULVERT	M	2170
138	620913	600 MM ALTERNATIVE PIPE CULVERT	M	2580
139	620919	750 MM ALTERNATIVE PIPE CULVERT	M	1220
140	620924	900 MM ALTERNATIVE PIPE CULVERT	M	210

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
141	620930	1050 MM ALTERNATIVE PIPE CULVERT	M	150
142	650069	450 MM REINFORCED CONCRETE PIPE	M	150
143	650075	600 MM REINFORCED CONCRETE PIPE	M	92
144	650084	1200 MM REINFORCED CONCRETE PIPE	M	390
145	665278	750 MM BITUMINOUS COATED PAVED INVERT CORRUGATED STEEL PIPE (2.01 MM THICK)	M	6
146	013483	1440 MM X 970 MM BITUMINOUS COATED PAVED INVERT CORRUGATED STEEL PIPE ARCH (2.01 MM THICK)	M	25
147	681134	80 MM PLASTIC PIPE (EDGE DRAIN)	M	3310
148	681137	80 MM PLASTIC PIPE (EDGE DRAIN OUTLET)	M	85
149	700617	DRAINAGE INLET MARKER	EA	3
150	703233	GRATED LINE DRAIN	M	410
151	013484	GRATED LINE DRAIN (WITH EXTENSIONS)	M	670
152	703369	900 MM BITUMINOUS COATED CORRUGATED STEEL PIPE RISER (2.01 MM THICK)	M	0.8
153	705337	600 MM ALTERNATIVE FLARED END SECTION	EA	1
154	707471	900 MM PRECAST CONCRETE PIPE RISER	M	24
155	708062	300 MM ALTERNATIVE PIPE RISER	M	5
156	708064	450 MM ALTERNATIVE PIPE RISER	M	11
157	721011	ROCK SLOPE PROTECTION (BACKING NO. 2, METHOD B)	M3	6
158	727901	MINOR CONCRETE (DITCH LINING)	M3	16
159	729010	ROCK SLOPE PROTECTION FABRIC	M2	21
160 (F)	731517	MINOR CONCRETE (GUTTER)	M	255

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
161	731530	MINOR CONCRETE (TEXTURED PAVING)	M2	3100
162	731627	MINOR CONCRETE (CURB, SIDEWALK AND CURB RAMP)	M3	140
163 (S-F)	750001	MISCELLANEOUS IRON AND STEEL	KG	31 060
164 (S-F)	750505	BRIDGE DECK DRAINAGE SYSTEM	KG	280
165 (S-F)	041304	MISCELLANEOUS METAL (BOX CULVERT)	KG	240
166 (S)	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	730
167	820107	DELINEATOR (CLASS 1)	EA	200
168	820110	MILEPOST MARKER	EA	5
169	820118	GUARD RAILING DELINEATOR	EA	57
170 (S)	832001	METAL BEAM GUARD RAILING	M	245
171	833080	CONCRETE BARRIER (TYPE K)	M	1820
172 (S)	839310	DOUBLE THRIE BEAM BARRIER	M	120
173 (S-F)	839521	CABLE RAILING	M	199
174 (S)	839541	TRANSITION RAILING (TYPE WB)	EA	5
175 (S)	839568	TERMINAL ANCHOR ASSEMBLY (TYPE SFT)	EA	13
176 (S)	839585	ALTERNATIVE FLARED TERMINAL SYSTEM	EA	18
177 (S)	839604	CRASH CUSHION (REACT 9CBB)	EA	4
178 (F)	041305	CONCRETE BARRIER (TYPE 60GE MODIFIED)	M	129
179 (F)	041306	CONCRETE BARRIER (TYPE 60D MODIFIED)	M	5
180 (F)	839701	CONCRETE BARRIER (TYPE 60)	M	3

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
181 (F)	839704	CONCRETE BARRIER (TYPE 60D)	M	249
182	839706	CONCRETE BARRIER (TYPE 60G)	M	300
183	839708	CONCRETE BARRIER (TYPE 60GC)	M	40
184	839709	CONCRETE BARRIER (TYPE 60GE)	M	400
185	839710	CONCRETE BARRIER (TYPE 60S)	M	1250
186	839712	CONCRETE BARRIER (TYPE 60SC)	M	5640
187	013485	CONCRETE BARRIER (TYPE GC MODIFIED)	M	43
188	013486	CONCRETE BARRIER (TYPE 736A MODIFIED)	M	1170
189	013487	CONCRETE BARRIER (TYPE 60SC MODIFIED)	M	93
190 (S)	840515	THERMOPLASTIC PAVEMENT MARKING	M2	170
191 (S)	840562	150 MM THERMOPLASTIC TRAFFIC STRIPE	M	240
192 (S)	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	1960
193 (S)	840564	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	920
194 (S)	840567	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 1.83 M - 0.30 M)	M	55
195 (S)	840571	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 5.18 M - 2.14 M)	M	380
196 (S)	840574	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 10.98 M - 3.66 M)	M	1160
197 (S)	013488	150 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 2.44 M - 1.22 M)	M	30
198 (S)	840656	PAINT TRAFFIC STRIPE (2-COAT)	M	254 000
199 (S)	840660	PAINT PAVEMENT MARKING	M2	94
200 (S)	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	37 800

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
201 (S)	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	15 000
202 (S)	860090	MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION	LS	LUMP SUM
203 (S)	860251	SIGNAL AND LIGHTING (LOCATION 1)	LS	LUMP SUM
204 (S)	860252	SIGNAL AND LIGHTING (LOCATION 2)	LS	LUMP SUM
205 (S)	860400	LIGHTING (TEMPORARY)	LS	LUMP SUM
206 (S)	860460	LIGHTING AND SIGN ILLUMINATION	LS	LUMP SUM
207 (S)	860530	CHANGEABLE MESSAGE SIGN SYSTEM	LS	LUMP SUM
208 (S)	013489	TEMPORARY COMMUNICATION SYSTEM	LS	LUMP SUM
209 (S)	860931	TRAFFIC MONITORING STATION (LOCATION 1)	LS	LUMP SUM
210 (S)	860932	TRAFFIC MONITORING STATION (LOCATION 2)	LS	LUMP SUM
211 (S)	860933	TRAFFIC MONITORING STATION (LOCATION 3)	LS	LUMP SUM
212 (S)	860934	TRAFFIC MONITORING STATION (LOCATION 4)	LS	LUMP SUM
213 (S)	860935	TRAFFIC MONITORING STATION (LOCATION 5)	LS	LUMP SUM
214 (S)	013490	TEMPORARY TRAFFIC MONITORING STATION	LS	LUMP SUM
215 (S)	013491	TEMPORARY RAMP METERING SYSTEM (LOCATION 1)	LS	LUMP SUM
216 (S)	013492	TEMPORARY RAMP METERING SYSTEM (LOCATION 2)	LS	LUMP SUM
217 (S)	013493	TEMPORARY RAMP METERING SYSTEM (LOCATION 3)	LS	LUMP SUM
218 (S)	013494	TEMPORARY RAMP METERING SYSTEM (LOCATION 4)	LS	LUMP SUM
219 (S)	013495	TEMPORARY RAMP METERING SYSTEM (LOCATION 5)	LS	LUMP SUM
220 (S)	013496	HOV REVERSIBLE LANE SYSTEM	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
221 (S)	013497	REMOVE AND MAINTAIN TOLL BOOTH SERVICES	LS	LUMP SUM
222 (S)	861101	RAMP METERING SYSTEM (LOCATION 1)	LS	LUMP SUM
223 (S)	861102	RAMP METERING SYSTEM (LOCATION 2)	LS	LUMP SUM
224 (S)	861103	RAMP METERING SYSTEM (LOCATION 3)	LS	LUMP SUM
225 (S)	861104	RAMP METERING SYSTEM (LOCATION 4)	LS	LUMP SUM
226 (S)	861105	RAMP METERING SYSTEM (LOCATION 5)	LS	LUMP SUM
227 (S)	013498	FIBER OPTIC COMMUNICATION SYSTEM	LS	LUMP SUM
228	999990	MOBILIZATION	LS	LUMP SUM

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISIONS

Annexed to Contract No. 11-2T0914

SECTION 1. SPECIFICATIONS AND PLANS

The work embraced herein shall conform to the provisions in the Standard Specifications dated July 1999, and the Standard Plans dated July 2004, of the Department of Transportation insofar as the same may apply, and these special provisions.

In case of conflict between the Standard Specifications and these special provisions, the special provisions shall take precedence over and shall be used in lieu of the conflicting portions.

The project plans for this project are not considered to be complete to construct the work anticipated by the contract. Design of the project, including preparation of final project plans, will be completed in a second phase after approval of the contract in conformance with the following:

Phase I shall consist of the following work:

- Title Sheet
- Typical Cross Sections
- Key Map and Line Index
- Layouts
- Profile and Superelevation Diagrams
- Temporary Water Pollution Control, Details, and Quantities
- Drainage Plan, Profiles, Details and Quantity Sheets
- Utility Plans
- Construction Area Signs and Traffic Handling Plans, Details, and Quantities
- Stage Construction and Traffic Handling Plans and Quantity Sheets
- Summary of Quantities
- Retaining Wall Plans, Details, Logs of Test Borings
- Temporary Electrical Plans
- Pomerado Road Overcrossing (Pony Bent)
- Retaining Wall ML 197
- Retaining Wall ML 219L
- Box Culvert DS ML 233 Modification
- Retaining Wall ML 239R

Complete design of Phase I, including final project plans for Phase I, is included in the project as released for bids.

Phase II shall consist of the following work:

- Construction Details
- Erosion Control, Details, and Quantities
- Contour Grading Plans
- Detour Plans
- Pavement Delineation and Sign Plans, Details, and Quantities
- Retaining Wall 202R
- Retining Wall ML 205L
- Irrigation Plans (To include Removal Plans)
- Electrical Plans

Complete design of Phase II, including final plans for Phase II, will be provided to the Contractor within 60 days after approval of the contract.

The issuance of Phase II will be by change order in conformance with Section 4, "Scope of Work," of the Standard Specifications.

Project plan sheets for Phase II are marked, "Preliminary for Bidding Purposes Only," and shall not be considered complete as to the design. These plan sheets are provided only to show the scope of the work to be performed, and shall only be used for the purpose of bid preparation.

Should the Department fail to provide the complete design, including final plans for Phase II within the times specified and, in the opinion of the Engineer, the controlling operation or operations are delayed or interfered with by the delay in providing the complete design, 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. Attention is directed to "Progress Schedule (Critical Path)" of these special provisions.

AMENDMENTS TO JULY 1999 STANDARD SPECIFICATIONS

UPDATED FEBRUARY 1, 2008

SECTION 0: GLOBAL REVISIONS

Issue Date: July 31, 2007

Global revisions are changes to contract documents not specific to a section of the Standard Specifications.

- In each contract document at each occurrence:
 1. Except where existing asphalt concrete is described, replace "asphalt concrete" with "hot mix asphalt"
 2. Except where existing AC is described, replace "AC" with "HMA" where AC means asphalt concrete

SECTION 1: DEFINITIONS AND TERMS

Issue Date: January 18, 2008

Section 1-1.01, "General," of the Standard Specifications is amended by adding the following:

- The Department is gradually changing 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.
- 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."

- Unless an object or activity is specified to be less than the total, the quantity or amount is all of the object or activity.

- All items in a list apply unless the items are specified as choices.
- Interpret terms as defined in the Contract documents. A term not defined in the Contract documents has the meaning defined in Means Illustrated Construction Dictionary, Condensed Version, Second Edition.

The 1st table in Section 1-1.02, "Abbreviations," of the Standard Specifications is amended by adding:

SSPC	The Society for Protective Coatings
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Section 1, "Definitions and Terms," of the Standard Specifications is amended by adding the following sections:

1-1.082 BUSINESS DAY

- Day on the calendar except Saturday or holiday.

1-1.084 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. Part 6 of the California MUTCD, "Temporary Traffic Control," supersedes the Department's Manual of Traffic Controls.

1-1.125 DEDUCTION

• Amount of money permanently taken from progress payment and final payment. Deductions are cumulative and are not retentions under Pub Cont Code § 7107.

1-1.205 FEDERAL-AID CONTRACT

- Contract that has a Federal-aid project number on the cover of the Notice to Contractors and Special Provisions.

1-1.245 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."

1-1.475 WITHHOLD

• Money temporarily or permanently taken from progress payment. Withholds are cumulative and are not retentions under Pub Cont Code § 7107.

Section 1-1.25, "Laboratory," of the Standard Specifications is amended to read:

1-1.25 LABORATORY

• The Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services of the Department of Transportation, or established laboratories of the various Districts of the Department, or other laboratories authorized by the Department to test materials and work involved in the contract. When a reference is made in the specifications to the "Transportation Laboratory," the reference shall mean Division of Engineering

Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

Section 1-1.255, "Legal Holidays," of the Standard Specifications is deleted.

Section 1-1.265, "Manual of Traffic Controls," of the Standard Specifications is deleted.

Section 1-1.275, "Office of Structure Design," of the Standard Specifications is amended to read:

1-1.275 OFFICES OF STRUCTURE DESIGN

- The Offices of Structure Design of the Department of Transportation. When the specifications require working drawings to be submitted to the Offices of Structure Design, the drawings shall be submitted to: Offices of Structure Design, Documents Unit, Mail Station 9-4/4I, 1801 30th Street, Sacramento, CA 95816, Telephone (916) 227-8252.

Section 1-1.39, "State," of the Standard Specifications is amended to read:

1-1.39 STATE

- The State of California, including its agencies, departments, or divisions, whose conduct or action is related to the work.

SECTION 2: PROPOSAL REQUIREMENTS AND CONDITIONS

Issue Date: June 19, 2003

Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications is amended to read:

2-1.03 Examination of Plans, Specifications, Contract, and Site of Work

- The bidder shall examine carefully the site of the work contemplated, the plans and specifications, and the proposal and contract forms therefor. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the general and local conditions to be encountered, as to the character, quality and scope of work to be performed, the quantities of materials to be furnished and as to the requirements of the proposal, plans, specifications and the contract.

- The submission of a bid shall also be conclusive evidence that the bidder is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information was reasonably ascertainable from an inspection of the site and the records of exploratory work done by the Department as shown in the bid documents, as well as from the plans and specifications made a part of the contract.

- Where the Department has made investigations of site conditions including subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources, bidders or contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.

- Where there has been prior construction by the Department or other public agencies within the project limits, records of the prior construction that are currently in the possession of the Department and which have been used by, or are known to, the designers and administrators of the project will be made available for inspection by bidders or contractors, upon written request, subject to the conditions hereinafter set forth. The records may include, but are not limited to, as-built drawings, design calculations, foundation and site studies, project reports and other data assembled in connection with the investigation, design, construction and maintenance of the prior projects.

- Inspection of the records of investigations and project records may be made at the office of the district in which the work is situated, or in the case of records of investigations related to structure work, at the Transportation Laboratory in Sacramento, California.

- When a log of test borings or other record of geotechnical data obtained by the Department's investigation of surface and subsurface conditions is included with the contract plans, it is furnished for the bidders' or Contractor's information and its use shall be subject to the conditions and limitations set forth in this Section 2-1.03.

- In some instances, information considered by the Department to be of possible interest to bidders or contractors has been compiled as "Materials Information." The use of the "Materials Information" shall be subject to the conditions and limitations set forth in this Section 2-1.03 and Section 6-2, "Local Materials."

- When cross sections are not included with the plans, but are available, bidders or contractors may inspect the cross sections and obtain copies for their use, at their expense.

- When cross sections are included with the contract plans, it is expressly understood and agreed that the cross sections do not constitute part of the contract, do not necessarily represent actual site conditions or show location, character, dimensions and details of work to be performed, and are included in the plans only for the convenience of bidders and their use is subject to the conditions and limitations set forth in this Section 2-1.03.
- When contour maps were used in the design of the project, the bidders may inspect those maps, and if available, they may obtain copies for their use.
- The availability or use of information described in this Section 2-1.03 is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section 2-1.03 and bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to be satisfied as to conditions to be encountered in the performance of the work and, with respect to possible local material sources, the quality and quantity of material available from the property and the type and extent of processing that may be required in order to produce material conforming to the requirements of the specifications.
- The Department assumes no responsibility for conclusions or interpretations made by a bidder or contractor based on the information or data made available by the Department. The Department does not assume responsibility for representation made by its officers or agents before the execution of the contract concerning surface or subsurface conditions, unless that representation is expressly stated in the contract.
- No conclusions or interpretations made by a bidder or contractor from the information and data made available by the Department will relieve a bidder or contractor from properly fulfilling the terms of the contract.

SECTION 3: AWARD AND EXECUTION OF CONTRACT

Issue Date: August 17, 2007

Section 3, "Award and Execution of Contract," of the Standard Specifications is amended by adding the following section after Section 3-1.02, "Contract Bonds":

3-1.025 INSURANCE POLICIES

- The successful bidder shall 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 certified public accountant certifying the accountant has applied Generally Accepted Accounting Principles (GAAP) guidelines confirming the successful bidder has sufficient funds and resources to cover any self-insured retentions if the self-insured retention is \$50 000 or higher.
- 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 in accordance with the provisions of Section 3700 of the Labor Code.

Section 3-1.03, "Execution of Contract," of the Standard Specifications is amended to read:

3-1.03 EXECUTION OF CONTRACT

- The contract shall be signed by the successful bidder and returned, together with the contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," within 10 business days of receiving the contract for execution.

Section 3-1.04, "Failure to Execute Contract," of the Standard Specifications is amended to read:

3-1.04 FAILURE TO EXECUTE CONTRACT

- Failure of the lowest responsible bidder, the second lowest responsible bidder, or the third lowest responsible bidder to execute the contract as required in Section 3-1.03, "Execution of Contract," within 10 business days of receiving the contract for execution shall be just cause for the forfeiture of the proposal guaranty. The successful bidder may file with the Department a written notice, signed by the bidder or the bidder's authorized representative, specifying that the bidder will refuse to execute the contract if it is presented. The filing of this notice shall have the same force and effect as the failure of the bidder to execute the contract and furnish acceptable bonds within the time specified.

Section 3-1.05, "Return of Proposal Guaranties," of the Standard Specifications is amended to read:

3-1.05 RETURN OF PROPOSAL GUARANTIES

- The Department keeps the proposal guaranties of the 1st, 2nd and 3rd lowest responsible bidders until the contract has been executed. The other bidders' guaranties, other than bidders' bonds, are returned upon determination of the 1st, 2nd, and 3rd apparent lowest bidders, and their bidders' bonds are of no further effect.

SECTION 4: SCOPE OF WORK

Issue Date: August 17, 2007

Section 4-1.01, "Intent of Plans and Specifications," of the Standard Specifications is amended by adding the following:

- Nothing in the specifications voids the Contractor's public safety responsibilities.

SECTION 5: CONTROL OF WORK

Issue Date: February 1, 2008

Section 5, "Control of Work," of the Standard Specifications is amended by adding the following sections:

5-1.005 GENERAL

- Failure to comply with any specification part is a breach of the contract and a waiver of your right to time or payment adjustment.

- After contract approval, submit documents and direct questions to the Engineer. Orders, approvals, and requests to the Contractor are by the Engineer.

- The Engineer furnishes the following in writing:

1. Approvals
2. Notifications
3. Orders

- The Contractor must furnish the following in writing:

1. Assignments
2. Notifications
3. Proposals
4. Requests, sequentially numbered
5. Subcontracts
6. 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.

5-1.015 RECORD RETENTION, INSPECTION, COPYING, AND AUDITING

- Retain project records and make them available for inspection, copying, and auditing by State representatives from bid preparation through:

1. Final payment
2. Resolution of claims, if any

- For at least 3 years after the later of these, retain and make available for inspection, copying, and auditing cost records by State representatives including:

1. Records pertaining to bid preparation
2. Overhead
3. Payroll records and certified payroll
4. Payments to suppliers and subcontractors
5. Cost accounting records
6. Records of subcontractors and suppliers

- Maintain the records in an organized way in the original format, electronic and hard copy, conducive to professional review and audit.

- Before contract acceptance, the State representative notifies the Contractor, subcontractor, or supplier 5 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.

Section 5-1.01, "Authority of Engineer," of the Standard Specifications is amended by adding:

- Failure to enforce a contract provision does not waive enforcement of any contract provision.

Section 5-1.02A, "Trench Excavation Safety Plans," of the Standard Specifications is amended to read:

5-1.02A Excavation Safety Plans

- The Construction Safety Orders of the Division of Occupational Safety and Health shall apply to all excavations. For all excavations 1.5 m or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Engineer.

- Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.

- No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.

- If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.

- Attention is directed to Section 7-1.01E, "Trench Safety."

Section 5-1.04, "Coordination and Interpretation of Plans, Standard Specifications, and Special Provisions," of the Standard Specifications is amended to read:

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. 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.

Section 5-1.07, "Lines and Grades," of the Standard Specifications is replaced with the following:

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.

Section 5-1.116, "Differing Site Conditions," is amended to read:

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

5-1.116C Protests

- You may protest the Engineer's decision by:
 1. Submitting an Initial Notice of Potential Claim within 5 business days after receipt of the Engineer's notification
 2. Complying with claim procedures
 - The Initial Notice of Potential Claim must detail the differences in your position from the Engineer's determination and support your position with additional information, including additional geotechnical data. Attach to the Initial Notice of Potential Claim a certification stating that you complied with Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work."
 - Promptly submit supplementary information when obtained.

SECTION 6: CONTROL OF MATERIALS

Issue Date: August 17, 2007

Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications is amended to read:

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

Section 6, "Control of Materials," of the Standard Specifications is amended by adding the following sections:

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.

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.

The 7th and 8th paragraph of Section 6-2.01, "General," of the Standard Specifications are amended to read:

- 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.

The 2nd sentence of the 7th paragraph of Section 6-2.02, "Possible Local Material Sources," of the Standard Specifications is amended to read:

- The Department deducts the charges for the removed material.

SECTION 7: LEGAL RELATIONS AND RESPONSIBILITY

Issue Date: February 1, 2008

Section 7-1.01, "Laws To Be Observed," of the Standard Specifications is amended to read:

7-1.01 LAWS TO BE OBSERVED

- Comply with laws, regulations, orders, decrees, and permits 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 permit 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 permit.

The 3rd listed requirement of the 1st paragraph of Section 7-1.01A(2), "Prevailing Wage," of the Standard Specifications is amended to read:

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.

The 2nd paragraph of Section 7-1.01A(2), "Prevailing Wage," of the Standard Specifications is amended to read:

- 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.

The 2nd paragraph of Section 7-1.01A(3), "Payroll Records," of the Standard Specifications is amended to read:

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- The Department withholds the penalties specified in subdivision (g) of Labor Code § 1776 for noncompliance with the requirements in Section 1776.

The 4th paragraph of Section 7-1.01A(3), "Payroll Records," of the Standard Specifications is amended to read:

- 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 \$1000.

The 5th paragraph of Section 7-1.01A(3), "Payroll Records," of the Standard Specifications is deleted.

The fourth sentence of the second paragraph of Section 7-1.02, "Load Limitations," of the Standard Specifications is amended to read:

- 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.

The eighth paragraph of Section 7-1.09, "Public Safety," of the Standard Specifications is amended to read:

- Signs, lights, flags, and other warning and safety devices and their use shall conform to the requirements set forth in Part 6 of the California MUTCD. Signs or other protective devices furnished and erected by the Contractor, at the Contractor's expense, as above provided, shall 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 and traffic control devices for which furnishing of, or payment for, is provided elsewhere in the specifications. Signs furnished and erected by the Contractor, at the Contractor's expense, shall be approved by the Engineer as to size, wording and location.

The fourteenth paragraph of Section 7-1.09, "Public Safety," of the Standard Specifications is amended to read:

- The Contractor shall notify the Engineer not less than 18 days and no more than 90 days prior to the anticipated start of an operation that will change the vertical or horizontal clearance available to public traffic (including shoulders).

The sixteenth paragraph of Section 7-1.09, "Public Safety," of the Standard Specifications is amended to read:

- When vertical clearance is temporarily reduced to 4.72 m or less, low clearance warning signs shall be placed in accordance with Part 2 of the California MUTCD and as directed by the Engineer. Signs shall conform to the dimensions, color, and legend requirements of the California MUTCD and these specifications except that the signs shall have black letters and numbers on an orange retroreflective background. W12-2P signs shall be illuminated so that the signs are clearly visible.

Section 7-1.01A(6), "Workers' Compensation," of the Standard Specifications is amended to read:

7-1.01A(6) (Blank)

The last sentence of the 2nd paragraph of Section 7-1.11, "Preservation of Property," of the Standard Specifications is amended to read:

- The cost of the repairs must be borne by the Contractor and will be deducted.

Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications is amended to read:

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 3-1.025, "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 337.1.

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 ≤\$5 000 000	\$1 000 000	\$2 000 000	\$2 000 000	\$10 000 000
>\$5 000 000 ≤\$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.

SECTION 8: PROSECUTION AND PROGRESS

Issue Date: August 17, 2007

The 2nd paragraph of Section 8-1.02, "Assignment," of the Standard Specifications is amended to read:

- If the Contractor assigns 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.

SECTION 9: MEASUREMENT AND PAYMENT

Issue Date: August 17, 2007

The last sentence of the 1st paragraph of Section 9-1.02, "Scope of Payment," of the Standard Specifications is amended to read:

- Neither the payment of any estimate nor of any retained percentage or withhold relieves the Contractor of any obligation to make good any defective work or material.

The third paragraph of Section 9-1.03, "Work Performed by Contractor," of the Standard Specifications is amended to read:

- The above markups shall constitute full compensation for all delay costs, overhead costs and profit which shall be deemed to include all items of expense not specifically designated as cost or equipment rental in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental." The total payment made as provided above shall be deemed to be the actual cost of the work and shall constitute full compensation therefor.

The 6th paragraph of Section 9-1.03C, "Records," of the Standard Specifications is deleted.

Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications is amended to read:

9-1.04 NOTICE OF POTENTIAL CLAIM

- It is the intention of this section that disputes between the parties arising under and by virtue of the contract be brought to the attention of the Engineer at the earliest possible time in order that the matters may be resolved, if possible, or other appropriate action promptly taken.

- Disputes will not be considered unless the Contractor has first complied with specified notice or protest requirements, including Section 4-1.03, "Changes," Section 5-1.116, "Differing Site Conditions," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," and Section 8-1.10, "Utility and Non-Highway Facilities."

- For disputes arising under and by virtue of the contract, including an act or failure to act by the Engineer, the Contractor shall provide a signed written initial notice of potential claim to the Engineer within 5 days from the date the dispute first arose. The initial notice of potential claim shall provide the nature and circumstances involved in the dispute which shall remain consistent through the dispute. The initial notice of potential claim shall be submitted on Form CEM-6201A furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Contractor shall assign an exclusive identification number for each dispute, determined by chronological sequencing, based on the date of the dispute.

- The exclusive identification number for each dispute shall be used on the following corresponding documents:

1. Initial notice of potential claim
2. Supplemental notice of potential claim
3. Full and final documentation of potential claim
4. Corresponding claim included in the Contractor's written statement of claims

- The Contractor shall provide the Engineer the opportunity to examine the site of work within 5 days from the date of the initial notice of potential claim. The Contractor shall proceed with the performance of contract work unless otherwise specified or directed by the Engineer.

- Throughout the disputed work, the Contractor shall maintain records that provide a clear distinction between the incurred direct costs of disputed work and that of undisputed work. The Contractor shall allow the Engineer access to the Contractor's project records deemed necessary by the Engineer to evaluate the potential claim within 20 days of the date of the Engineer's written request.

- Within 15 days of submitting the initial notice of potential claim, the Contractor shall provide a signed supplemental notice of potential claim to the Engineer that provides the following information:

1. The complete nature and circumstances of the dispute which caused the potential claim
2. The contract provisions that provide the basis of claim
3. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined
4. A time impact analysis of the project schedule that illustrates the effect on the scheduled completion date due to schedule changes or disruptions where a request for adjustment of contract time is made

- The information provided in items 1 and 2 above shall provide the Contractor's complete reasoning for additional compensation or adjustments.

- The supplemental notice of potential claim shall be submitted on Form CEM-6201B furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Engineer will evaluate the information presented in the supplemental notice of potential claim and provide a written response to the Contractor within 20 days of its receipt. If the estimated cost or effect on the scheduled completion date changes, the Contractor shall update information in items 3 and 4 above as soon as the change is recognized and submit this information to the Engineer.

- Within 30 days of the completion of work related to the potential claim, the Contractor shall provide the full and final documentation of potential claim to the Engineer that provides the following information:

1. A detailed factual narration of events fully describing the nature and circumstances that caused the dispute, including, but not limited to, necessary dates, locations, and items of work affected by the dispute
2. The specific provisions of the contract that support the potential claim and a statement of the reasons these provisions support and provide a basis for entitlement of the potential claim
3. When additional monetary compensation is requested, the exact amount requested calculated in conformance with Section 9-1.03, "Force Account Payment," or Section 8-1.09, "Right of Way Delays," including an itemized breakdown of individual costs. These costs shall be segregated into the following cost categories:

- 3.1. Labor – A listing of individuals, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information related to the requested reimbursement of labor costs
- 3.2. Materials – Invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information related to the requested reimbursement of material costs
- 3.3. Equipment – Listing of detailed description (make, model, and serial number), hours of use, dates of use and equipment rates. Equipment rates shall be at the applicable State rental rate as listed in the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates," in effect when the affected work related to the dispute was performed.
- 3.4. Other categories as specified by the Contractor or the Engineer

4. When an adjustment of contract time is requested the following information shall be provided:

- 4.1. The specific dates for which contract time is being requested
- 4.2. The specific reasons for entitlement to a contract time adjustment
- 4.3. The specific provisions of the contract that provide the basis for the requested contract time adjustment
- 4.4. A detailed time impact analysis of the project schedule. The time impact analysis shall show the effect of changes or disruptions on the scheduled completion date to demonstrate entitlement to a contract time adjustment.

5. The identification and copies of the Contractor's documents and the substance of oral communications that support the potential claim

- The full and final documentation of the potential claim shall be submitted on Form CEM-6201C furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655.

- Pertinent information, references, arguments, and data to support the potential claim shall be included in the full and final documentation of potential claim. Information submitted subsequent to the full and final documentation submittal will not be considered. Information required in the full and final documentation of potential claim, as listed in items 1 to 5 above, that is not applicable to the dispute may be exempted as determined by the Engineer. No full and final documentation of potential claim will be considered that does not have the same nature and circumstances, and basis of claim as those specified on the initial and supplemental notices of potential claim.

- The Engineer will evaluate the information presented in the full and final documentation of potential claim and provide a written response to the Contractor within 30 days of its receipt unless otherwise specified. The Engineer's receipt of the full and final documentation of potential claim shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand. If the full and final documentation of potential claim is submitted by the Contractor after acceptance of the work by the Director, the Engineer need not provide a written response.

- Provisions in this section shall not apply to those claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate. Administrative disputes are disputes of administrative deductions or withholds, contract item quantities, contract item adjustments, interest payments, protests of contract change orders as provided in Section 4-1.03A, "Procedure and Protest," and protests of the Weekly Statement of Working Days as provided in Section 8-1.06, "Time of Completion." Administrative disputes that occur prior to issuance of the proposed final estimate shall follow applicable requirements of this section. Information listed in the supplemental notice and full and final documentation of potential claim that is not applicable to the administrative dispute may be exempted as determined by the Engineer.

- Unless otherwise specified in the special provisions, the Contractor may pursue the administrative claim process pursuant to Section 9-1.07B, "Final Payment and Claims," for any potential claim found by the Engineer to be without merit.

- Failure of the Contractor to conform to specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract, and is deemed as the Contractor's waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim process in conformance with Section 9-1.07B, "Final Payment of Claims," and shall operate as a bar to arbitration pursuant to Section 10240.2 of the California Public Contract Code.

Section 9-1.05, "Stop Notices," of the Standard Specifications is amended to read:

9-1.05 STOP NOTICE WITHHOLDS

- The Department may withhold payments to cover claims filed under Civ Code § 3179 et seq.

Section 9, "Measurement and Payment," of the Standard Specifications is amended by adding the following sections:

9-1.053 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 quality control 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.

- The Department returns performance-failure withholds in the progress payment following the correction of noncompliance.

9-1.055 PENALTY WITHHOLDS

- Penalties include fines and damages that are proposed, assessed, or levied against you or the Department by a governmental agency or citizen lawsuit. Penalties are also payments made or costs incurred in settling alleged permit violations of Federal, State, or local laws, regulations, or requirements. 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 and notify you within 15 days of the withhold. If the penalty amount is less than the amount being withheld from progress payments for retentions, the Department will not withhold the penalty amount.

- If the penalty is resolved for less than the amount withheld, the Department pays interest at a rate of 6 percent per year on the excess withhold. If the penalty is not resolved, the withhold becomes a deduction.

- Instead of the withhold, you may provide a bond payable to the Department of Transportation equal to the highest estimated liability for any disputed penalties proposed.

9-1.057 PROGRESS WITHHOLDS FOR FEDERAL-AID CONTRACTS

- Section 9-1.057, "Progress Withholds for Federal-Aid Contracts," applies to a Federal-aid contract.
- 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.

The 3rd paragraph of Section 9-1.06, "Partial Payments," of the Standard Specifications is amended to read:

- For a non-Federal-aid project, the Department retains 10 percent of the estimated value of the work done and 10 percent of the value of materials estimated to have been furnished and delivered and unused or furnished and stored as part security for the fulfillment of the contract by the Contractor, except that at any time after 20 percent of the work has been completed, if the Engineer finds that satisfactory progress is being made, the Department may reduce the total amount being retained from payment pursuant to the above requirements to 5 percent of the total estimated value of the work and materials and may also reduce the amount retained from any of the remaining partial payments to 5 percent of the estimated value of the work and materials. In addition, on any partial payment made after 95 percent of the work has been completed, the Department may reduce the amount retained from payment pursuant to the requirements of this Section 9-1.06, to such lesser amount as the Department determines is adequate security for the fulfillment of the balance of the work and other requirements of the contract, but in no event is that amount reduced to less than 125 percent of the estimated value of the work yet to be completed as determined by the Engineer. The reduction is made only upon the request of the Contractor and must be approved in writing by the surety on the performance bond and by the surety on the payment bond. The approval of the surety must be submitted to the Disbursing Officer of the Department; the signature of the person executing the approval for the surety must be properly acknowledged and the power of attorney authorizing the person to give that consent must either accompany the document or be on file with the Department. The retentions specified in this paragraph are those defined in Pub Cont Code § 7107(b).

The 1st sentence of the 4th paragraph of Section 9-1.06, "Partial Payments," of the Standard Specifications is amended to read:

- The Department shall pay monthly to the Contractor, while carrying on the work, the balance not retained, as aforesaid, after deducting therefrom all previous payments and all sums to be deducted or withheld under the provisions of the contract.

The title and 1st and 2nd paragraphs of Section 9-1.065, "Payment of Withheld Funds," of the Standard Specifications are amended to read:

9-1.065 RELEASE OF RETAINED FUNDS

- The Department releases retained funds if you:
 1. Request release of the retention (Pub Cont Code § 10263) in writing
 2. Deposit securities equivalent to the funds you want released into escrow with the State Treasurer or with a bank acceptable to the Department
 3. Are the beneficial owner of and receive interest on the deposited securities substituted for the retained funds

The 2nd sentence Section 9-1.07A, "Payment Prior to Proposed Final Estimate," of the Standard Specifications is amended to read:

- The Department pays the balance due less previous payments, deductions, withholds, and retentions under the provisions of the contract and those further amounts that the Engineer determines to be necessary pending issuance of the proposed final estimate and payment thereon.

Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications is amended to read:

9-1.07B Final Payment and Claims

- After acceptance by the Director, the Engineer makes a proposed final estimate of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work, and other basis for payment, and shows each deduction made or to be made for prior payments and amounts to be deducted, withheld, or retained under the provisions of the contract. Prior estimates and payments are subject to correction in the proposed final estimate. The Contractor must submit written approval of the proposed final estimate or a written statement of claims arising under or by virtue of the contract so that the Engineer receives the written approval or statement of claims no later than close of business of the 30th day after receiving the proposed final estimate. The Contractor's receipt of the proposed final estimate must be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims must be evidenced by postal receipt or the Engineer's written receipt if delivered by hand.

- On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue a final estimate in writing in conformance with the proposed final estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in conformance with the proposed final estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum found to be due. The semifinal estimate and corresponding payment shall be conclusive and binding against both parties to the contract on each question relating to the amount of work done and the compensation payable therefor, except insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- Except for claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate, the Contractor shall only provide the following two items of information for each claim:

1. The exclusive identification number that corresponds to the supporting full and final documentation of potential claim
2. The final amount of requested additional compensation

- If the final amount of requested additional compensation is different than the amount of requested compensation included in the full and final documentation of potential claim, the Contractor shall provide in the written statement of claims the reasons for the changed amount, the specific provisions of the contract which support the changed amount, and a statement of the reasons the provisions support and provide a basis for the changed amount. If the Contractor's claim fails to provide an exclusive identification number or if there is a disparity in the provided exclusive identification number, the Engineer will notify the Contractor of the omission or disparity. The Contractor shall have 15 days after receiving notification from the Engineer to correct the omission or disparity. If after the 15 days has elapsed, there is still an omission or disparity of the exclusive identification number assigned to the claim, the Engineer will assign the number. No claim will be considered that has any of the following deficiencies:

1. The claim does not have the same nature, circumstances, and basis as the corresponding full and final documentation of potential claim.
2. The claim does not have a corresponding full and final documentation of potential claim.
3. The claim was not included in the written statement of claims.
4. The Contractor did not comply with applicable notice or protest requirements of Sections 4-1.03, "Changes," 5-1.116, "Differing Site Condition," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," 8-1.10, "Utility and Non-Highway Facilities," and 9-1.04, "Notice of Potential Claim."

- Administrative disputes that occur after issuance of the proposed final estimate shall be included in the Contractor's written statement of claims in sufficient detail to enable the Engineer to ascertain the basis and amounts of those claims.

- The Contractor shall keep full and complete records of the costs and additional time incurred for work for which a claim for additional compensation is made. The Engineer or designated claim investigators or auditors shall have access to those records and any other records as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to permit access to those records shall be sufficient cause for denying the claims.

- The written statement of claims submitted by the Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code Section 12650 et. seq., the undersigned,

(name) _____ of

(title) _____

(company)

hereby certifies that the claim for the additional compensation and time, if any, made herein for the work on this contract is a true statement of the actual costs incurred and time sought, and is fully documented and supported under the contract between parties.

Dated _____
 /s/ _____
 Subscribed and sworn before me this _____ day
 of _____

(Notary Public)
 My Commission
 Expires _____

- Failure to submit the notarized certificate will be sufficient cause for denying the claim.
- Any claim for overhead, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Any claim for overhead shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Department will deduct an offset amount for field and home office overhead paid on all added work from any claim for overhead as appropriate, as determined by the Department. The value of the added work equals the value of the work completed minus the total bid. The home office overhead offset equals 5 percent of the added work. The field office overhead offset equals 5-1/2 percent of the added work. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. 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 Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

1. Allowable in conformance with the requirements in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31.
2. Adequately supported by reliable documentation.
3. Related solely to the project under examination.

- Costs or expenses incurred by the State in reviewing or auditing claims that are not supported by the Contractor's cost accounting or other records shall be deemed to be 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 will schedule a board of review meeting. The Contractor shall meet with the review board or person and make a presentation in support of the claim. Attendance by the Contractor at the board of review meeting shall be mandatory.

- The District Director of the District that administered the contract will make the final determination of any claims which remain in dispute after completion of claim review by the Engineer or board of review meeting.

The final determination of claims will be sent to the Contractor by hand delivery or deposit in the U.S. mail. The Engineer will then make and issue the Engineer's final estimate in writing and within 30 days thereafter the State will pay the entire sum, if any, found due thereon. That final estimate shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- Failure of the Contractor to conform to the specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall operate as a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

SECTION 12: CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Issue Date: October 6, 2006

The second paragraph of Section 12-1.01, "Description," of the Standard Specifications is amended to read:

- Attention is directed to Part 6 of the California MUTCD. Nothing in this Section 12 is to be construed as to reduce the minimum standards in these manuals.

Section 12-2.01, "Flaggers," of the Standard Specifications is amended to read:

- 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.

The first paragraph of Section 12-3.01, "General," of the Standard Specifications is amended to read:

- 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.

The fifth paragraph of Section 12-3.01, "General," of the Standard Specifications is amended to read:

- Retroreflective sheeting shall conform to the requirements in ASTM Designation: D 4956 and to the special provisions.

The first paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

- The term "Construction Area Signs" shall include all temporary signs required for the direction of public traffic through or around the work during construction. Construction area signs are shown in or referred to in Part 6 of the California MUTCD.

The fourth paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

- 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. All sign panels shall be the product of a commercial sign manufacturer, and shall be as specified in these specifications.

The eighth paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

- 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. A significant difference between day and nighttime retroreflective color will be grounds for rejecting signs.

Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications is amended by deleting the third, fourth, fifth, and sixth paragraphs.

SECTION 15: EXISTING HIGHWAY FACILITIES

Issue Date: November 2, 2004

The sixth paragraph of Section 15-2.07, "Payment," of the Standard Specifications is amended to read:

- Full compensation for removing, salvaging, reconstructing, relocating or resetting end caps, return caps, terminal sections, and buried post anchors, for metal beam guard railings and three beam barriers, and for connecting reconstructed, relocated or reset railings and barriers to new and existing facilities, including connections to concrete, shall be considered as included in the contract price paid per meter for the type of railing or barrier work involved and no additional compensation will be allowed therefor.

SECTION 19: EARTHWORK

Issue Date: July 31, 2007

The third paragraph of Section 19-1.02, "Preservation of Property," of the Standard Specifications is amended to read:

- In addition to the provisions in Sections 5-1.02, "Plans and Working Drawings," and 5-1.02A, "Excavation Safety Plans," detailed plans of the protective systems for excavations on or affecting railroad property will be reviewed for adequacy of protection provided for railroad facilities, property, and traffic. These plans shall be submitted at least 9 weeks before the Contractor intends to begin excavation requiring the protective systems. Approval by the Engineer of the detailed plans for the protective systems will be contingent upon the plans being satisfactory to the railroad company involved.

Section 19-1.03, "Grade Tolerance," of the Standard Specifications is amended to read:

- 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 15 mm 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 tonne, the grading plane at any point shall not vary more than 30 mm 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 meter, the grading plane at any point shall be not more than 15 mm above the grade established by the Engineer.

The first paragraph of Section 19-3.025C, "Soil Cement Bedding," of the Standard Specifications is amended to read:

- 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.

The fourth paragraph of Section 19-3.025C, "Soil Cement Bedding," of the Standard Specifications is amended to read:

- The aggregate, cementitious material, and water shall be proportioned either by mass or by volume. Soil cement bedding shall contain not less than 175 kg of cementitious material per cubic meter. 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.

The first paragraph of Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications is amended to read:

- Slurry cement backfill shall consist of a fluid, workable mixture of aggregate, cementitious material, and water.

The fifth paragraph of Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications is amended to read:

- Cementitious material shall conform to the provisions in Section 90-2.01, "Cementitious Materials." Supplementary cementitious material will not be required.

The eighth paragraph of Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications is amended to read:

- The aggregate, cementitious material, and water shall be proportioned either by mass or by volume. Slurry cement backfill shall contain not less than 110 kg of cementitious material per cubic meter. 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

Issue Date: August 17, 2007

Section 20-2.03, "Soil Amendment," of the Standard Specifications is amended to read:

20-2.03 SOIL AMENDMENT

- Soil amendment shall comply with the requirements in the California Food and Agricultural Code.
- Soil amendment producers shall comply with the following:
 1. Be fully permitted to produce compost as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
 2. Be a participant in United States Composting Council's Seal of Testing Assurance program.
- Soil amendment shall be composted and may be derived from any single, or mixture of any of the following feedstock materials:
 1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
 2. Biosolids
 3. Manure
 4. Mixed food waste
- Soil amendment feedstock materials shall be composted to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.
 - Soil amendment shall not be derived from mixed municipal solid waste and must be reasonably free of visible contaminants. Soil amendment must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Soil amendment must not possess objectionable odors.
 - Metal concentrations in soil amendment must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
 - Soil amendment must comply with the following:

Physical/Chemical Requirements

Property	Test Method	Requirement
pH	*TMECC 04.11-A, Elastometric pH 1:5 Slurry Method, pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A, Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A, Total Solids & Moisture at 70+/- 5 deg C, % Wet Weight Basis	30–60
Organic Matter Content	TMECC 05.07-A, Loss-On-Ignition Organic Matter Method (LOI), % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A, Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B, Carbon Dioxide Evolution Rate mg CO ₂ -C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	95% Passing 5/8 inch 70% Passing 3/8 inch
Pathogen	TMECC 07.01-B, Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B, Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Plastic, Glass and Metal, % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C, Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles), % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

- Prior to application, the Contractor shall provide the Engineer with a copy of the soil amendment producer's Compost Technical Data Sheet and a copy of the compost producers STA certification. The Compost Technical Data Sheet shall include laboratory analytical test results, directions for product use, and a list of product ingredients.
- Prior to application, the Contractor shall provide the Engineer with a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

The last 3 paragraphs of Section 20-2.10, "Seed," of the Standard Specifications are deleted.

Section 20-2.25, "Backflow Preventers," of the Standard Specifications is amended to read:

20-2.25 BACKFLOW PREVENTERS

- Backflow preventers shall be one of the reduced pressure principle devices as specified in these specifications and the special provisions.
- Backflow preventers shall be factory assembled and shall include 2 check valves, one pressure differential relief valve, 2 shut-off valves and 4 test cocks. Backflow preventer and valves shall be the same size as the pipeline in which they are installed, unless otherwise shown on the plans.
- Backflow preventer shut-off valves shall be manufactured from iron or bronze and shall be either resilient wedged gate valves, resilient seated and fully ported ball valves, or resilient seated butterfly valves. Threaded type shut-off valves shall be provided with a union on one side of each valve. Unions shall be brass or malleable iron.

The last paragraph of Section 20-3.04A, "General," of the Standard Specifications is deleted.

Section 20-4.055, "Pruning," of the Standard Specifications is amended to read:

20-4.055 PRUNING

- Pruning of plants shall be consistent with American National Standards Institute (ANSI), "Tree, Shrub and Other Woody Plant Maintenance Standard Practices," ANSI 300 (Part 1)-2001 and "Best Management Practices Tree Pruning," 2002 (ISBN 1-881956318), published by the International Society of Arboriculture, P.O. Boc 3129, Champaign, IL 61826.

Section 20-5.03J, "Check and Test Backflow Preventers," of the Standard Specifications is amended to read:

20-5.03J Check and Test Backflow Preventers

- Backflow preventers shall be checked and tested for proper operation by a certified Backflow Preventer Tester. The tester shall hold a valid certification as a Backflow Preventer Tester from the local governing authority in which the device to be tested is located. The local governing authority shall be the county, city or water purveyor having the governing authority over testing of backflow preventers involved. If the local governing authority does not have a certification program for Backflow Preventer Testers, the tester shall have a certificate from one of the following:

- A. The American Water Works Association.
- B. A county which has a certification program for Backflow Preventer Testers.

- Tests for proper operation shall conform to the requirements of the governing authority.
- The Engineer shall be notified at least 5 days prior to testing backflow preventers.
- One copy of the test results for each backflow preventer tested shall be furnished to the Engineer.
- Backflow preventers, installed by the Contractor, failing required tests shall be repaired at the Contractor's expense.

SECTION 25: AGGREGATE SUBBASES

Issue Date: February 16, 2007

The first paragraph of Section 25-1.02A, "Class 1, Class 2, and Class 3 Aggregate Subbases," of the Standard Specifications is amended to read:

- 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

The first paragraph of Section 25-1.02B, "Class 4 Aggregate Subbase," of the Standard Specifications is amended to read:

- 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 BASE

Issue Date: February 16, 2007

The first paragraph of Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications is amended to read:

- 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

The first paragraph of Section 26-1.02B, "Class 3 Aggregate Base," of the Standard Specifications is amended to read:

- 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

Issue Date: July 31, 2007

The first paragraph of Section 27-1.02, "Materials," of the Standard Specifications is amended to read:

- Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

The third paragraph of Section 27-1.02, "Materials," of the Standard Specifications is amended to read:

- 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 mass 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 5.2 MPa at 7 days, when tested by California Test 312.

The fourth paragraph of Section 27-1.02, "Materials," of the Standard Specifications is amended to read:

- 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 mass of the dry aggregate.

The ninth paragraph of Section 27-1.07, "Compacting," of the Standard Specifications is amended to read:

- 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

Issue Date: July 31, 2007

The first paragraph of Section 28-1.02, "Materials," of the Standard Specifications is amended to read:

- Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

The sixth paragraph of Section 28-1.02, "Materials," of the Standard Specifications is amended to read:

- Aggregate shall be of such quality that, when mixed with cement in an amount not to exceed 180 kg per cubic meter, and tested in conformance with the requirements in California Test 548, the compressive strength of a sample will be not less than 5.0 MPa at 7 days.

The second paragraph of Section 28-1.06, "Spreading, Compacting and Shaping," of the Standard Specifications is amended to read:

- 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.

The second paragraph of Section 28-1.08, "Surfaces Not Within Tolerance," of the Standard Specifications is amended to read:

- Hardened lean concrete base with a surface lower than 15 mm 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 meter 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 meter for lean concrete base and no additional compensation will be allowed therefor.

SECTION 29: TREATED PERMEABLE BASES

Issue Date: July 31, 2007

The fourth paragraph of Section 29-1.02A, "Asphalt Treated Permeable Base," of the Standard Specifications is amended to read:

- The type and grade of asphalt binder to be mixed with aggregate will be specified in the special provisions.

The second paragraph of Section 29-1.02B, "Cement Treated Permeable Base," of the Standard Specifications is amended to read:

- Cement shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

The first paragraph of Section 29-1.04A, "Asphalt Treated Permeable Base," of the Standard Specifications is amended to read:

• 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 135°C nor more than 165°C.
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 mass 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 mass 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 kilograms of asphalt per 100 kg of dry aggregate shall not vary by more than 0.5-kg of asphalt above or 0.5-kg 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-kg of asphalt per 100 kg of dry aggregate.

The second paragraph of Section 29-1.04B, "Cement Treated Permeable Base," of the Standard Specifications is amended to read:

- Cement treated permeable base shall contain not less than 170 kg of cement per cubic meter.

The first paragraph of Section 29-1.05, "Spreading and Compacting Asphalt Treated Permeable Base," of the Standard Specifications is amended to read:

• 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.

The second paragraph of Section 29-1.07, "Surfaces Not Within Tolerance," of the Standard Specifications is amended to read:

• Hardened treated permeable base with a surface lower than 15 mm 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 meter for treated permeable base and no additional compensation will be allowed therefor.

SECTION 37: BITUMINOUS SEALS

Issue Date: August 17, 2007

The fourth through sixth paragraphs in Section 37-1.03, "Maintaining Traffic," of the Standard Specifications are amended to read:

- 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 600-m 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 600-m 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.

The second paragraph of Section 37-1.07, "Finishing," of the Standard Specifications is amended to read:

- 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.

The second paragraph in Section 37-1.09, "Payment," of the Standard Specifications is amended to read:

- 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.

SECTION 39: HOT MIX ASPHALT

Issue Date: July 31, 2007

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 the HMA type as:

1. Type A
2. Type B
3. Open graded friction course (OGFC). OGFC includes 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 as:

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 for pavement reinforcing fabric in Section 88, "Engineering Fabrics."

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.

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 mass 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	$X \pm 3^a$
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 mass 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 mass 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 2.36 mm sieve)	LP-10	100
High natural CRM gradation (% passing 2.00 mm sieve)	LP-10	100
Wire in CRM (% max.)	LP-10	0.01
Fabric in CRM (% max.)	LP-10	0.05
CRM particle length (mm max.) ^a	--	4.75
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 mass of CRM.

Asphalt Rubber Binder Design and Profile

- Submit in writing an asphalt rubber binder design and profile. In the design, designate the asphalt, asphalt modifier, and CRM and their proportions. The profile is not a 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 135 degrees C for a period of 16 hours. After the 16-hour cool-down (1320 minutes 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 @ 350 °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 4.75-mm sieve is coarse
2. Passing the 4.75-mm sieve is fine
3. Added and passing the 0.6-mm 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**

19-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
25-mm	100	—
19-mm	90 - 100	TV ±5
12.5-mm	70 - 90	TV ±6
4.75-mm	45 - 55	TV ±7
2.36-mm	32 - 40	TV ±5
0.6-mm	12 - 21	TV ±4
0.075-mm	2 - 7	TV ±2

12.5-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
19-mm	100	—
12.5-mm	95 - 99	TV ±6
9.5-mm	75 - 95	TV ±6
4.75-mm	55 - 66	TV ±7
2.36-mm	38 - 49	TV ±5
0.6-mm	15 - 27	TV ±4
0.075-mm	2 - 8	TV ±2

9.5-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
12.5-mm	100	—
9.5-mm	95 - 100	TV ±6
4.75-mm	58 - 72	TV ±7
2.36-mm	34 - 48	TV ±6
0.6-mm	18 - 32	TV ±5
0.075-mm	2 - 9	TV ±2

4.75-mm HMA Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
9.5-mm	100	—
4.75-mm	95 - 100	TV ±7
2.36-mm	72 - 77	TV ±7
0.6-mm	37 - 43	TV ±7
0.075-mm	2 - 12	TV ±4

Rubberized Hot Mix Asphalt - Gap Graded (RHMA-G)

19-mm RHMA-G

Sieve Sizes	Target Value Limits	Allowable Tolerance
25-mm	100	—
19-mm	95 - 100	TV ±5
12.5-mm	83 - 87	TV ±6
9.5-mm	65 - 70	TV ±6
4.75-mm	28 - 42	TV ±7
2.36-mm	14 - 22	TV ±5
0.075-mm	0 - 6	TV ±2

12.5-mm RHMA-G

Sieve Sizes	Target Value Limits	Allowable Tolerance
19-mm	100	—
12.5-mm	90 - 100	TV ±6
9.5-mm	83 - 87	TV ±6
4.75-mm	28 - 42	TV ±7
2.36-mm	14 - 22	TV ±5
0.075-mm	0 - 6	TV ±2

Open Graded Friction Course (OGFC)

25-mm OGFC

Sieve Sizes	Target Value Limits	Allowable Tolerance
37.5-mm	100	—
25-mm	99 - 100	TV ±5
19-mm	85 - 96	TV ±5
12.5-mm	55 - 71	TV ±6
4.75-mm	10 - 25	TV ±7
2.36-mm	6 - 16	TV ±5
0.075-mm	1 - 6	TV ±2

12.5-mm OGFC

Sieve Sizes	Target Value Limits	Allowable Tolerance
19-mm	100	—
12.5-mm	95 - 100	TV ±6
9.5-mm	78 - 89	TV ±6
4.75-mm	28 - 37	TV ±7
2.36-mm	7 - 18	TV ±5
0.6-mm	0 - 10	TV ±4
0.075-mm	0 - 3	TV ±2

9.5 mm OGFC

Sieve Sizes	Target Value Limits	Allowable Tolerance
12.5-mm	100	—
9.5-mm	90 - 100	TV ±6
4.75-mm	29 - 36	TV ±7
2.36-mm	7 - 18	TV ±6
0.6-mm	0 - 10	TV ±5
0.075-mm	0 - 3	TV ±2

- Before the addition of asphalt binder, 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 4.75-mm sieve and retained on 2.36-mm sieve.)		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 ^a (min.)	CT 217	47	42	47	--
Fine aggregate angularity (% min.) ^b	AASHTO T 304 Method A	45	45	45	--
Flat and elongated particles (% max. @ 5:1)	ASTM D 4791	10	10	10	10
K _c factor (max.)	CT 303	1.7	1.7	1.7	--
K _f factor (max.)	CT 303	1.7	1.7	1.7	--

Notes:

- a. Reported value must be the average of 3 tests from a single sample.
- b. The Engineer waives this specification if HMA contains less than 10 percent of nonmanufactured sand by mass of total aggregate.

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 in this Section 39, "Hot Mix Asphalt," 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 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 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 HMA-102 to document aggregate quality and mix design data. Use Form HMA-101 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:

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 HMA-103.

39-1.03B HOT MIX ASPHALT FOR JOB MIX FORMULA

- Determine the proposed JMF from a mix design that complies with:

Hot Mix Asphalt for Job Mix Formula

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			
4.75-mm grading		17	17	--
9.5-mm grading		15	15	--
12.5-mm grading		14	14	18 – 23 ^b
19-mm grading	13	13	18 – 23 ^b	
Voids filled with asphalt (%)	LP-3	65 - 75	65 - 75	Note d
Dust proportion	LP-4			
4.75-mm and 9.5-mm gradings		0.9 – 2.0	0.9 – 2.0	Note d
12.5-mm and 19-mm gradings		0.6 – 1.3	0.6 – 1.3	
Stabilometer value °(min.)	CT 366			
4.75-mm and 9.5-mm gradings		30	30	--
12.5-mm and 19-mm 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 60 degrees ± 3 degrees C by allowing the briquettes to cool at room temperature for 0.5-hour, then place the briquettes in the oven at 60 degrees C for a minimum of 2 hours and not more than 3 hours."
- d. Report this value in the JMF submittal.

- For mix design, prepare 3 briquettes separately at the proposed JMF 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 12 points.

39-1.03C JOB MIX FORMULA SUBMITTAL

- Each JMF submittal must consist of:
 1. Proposed JMF on Form HMA-101
 2. Aggregate quality test data on Form HMA-102
 3. Asphalt rubber binder design and profile on Form HMA-102
 4. Mix design data on Form HMA-102
 5. JMF verification on Form HMA-103, if applicable
 6. Materials Safety Data Sheets (MSDS) for:
 - 6.1. Asphalt binder
 - 6.2. Base asphalt binder used in asphalt rubber binder
 - 6.3. CRM and asphalt modifier used in asphalt rubber binder
 - 6.4. Blended asphalt rubber binder mixture
 - 6.5. Supplemental fine aggregate except fines from dust collectors
 - 6.6. Anti-strip additives

7. Material samples submitted in labeled containers weighing no more than 22.5 kg each (notify the Engineer at least 2 business days before sampling materials):
 - 7.1. Coarse, fine, and supplemental fine aggregate from stockpiles, cold feed belts, or hot bins. Samples must include at least 55 kg for each coarse aggregate, 35 kg for each fine aggregate, and 4.5 kg for each type of supplemental fines.
 - 7.2. RAP from stockpiles or RAP system. Samples must be at least 30 kg.
 - 7.3. Asphalt binder from the binder supplier. Samples must be in two 1-liter cylindrical shaped cans with open top and friction lids.
 - 7.4. Asphalt rubber binder with the components blended in the proportions to be used. Samples must be in four 1-liter cylindrical shaped cans with open top and friction lids.

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 HMA-103 dated within 12 months before HMA production, the Engineer verifies the JMF. The Engineer verifies each proposed JMF within 20 days from the complete JMF submittal. Verification consists of testing for compliance with the specifications.
- Based on your testing and production experience, you may submit in writing on Form HMA-101 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 ± 0.3 percent 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

- Test samples from the HMA plant to be used to determine possible JMF adjustments.
- For HMA Type A, Type B, and RHMA-G, the Engineer verifies the JMF from samples taken from the HMA plant to be used. The Engineer verifies the JMF by testing plant-produced samples for:

1. Aggregate quality
2. Aggregate gradation (JMF TV \pm tolerance)
3. Asphalt binder content (JMF TV \pm tolerance)
4. HMA quality specified in the table Hot Mix Asphalt for Job Mix Formula except:

- 4.1. Air voids content (design value \pm 2.0 percent)
- 4.2. Voids filled with asphalt (report only)
- 4.3. Dust proportion (report only)

- If you request in writing, the Engineer verifies RHMA-G quality requirements within 3 business days of sampling.
- In the Engineer's presence and from the same production run, take samples of aggregate, asphalt binder, RAP, and HMA. Sample aggregate from cold feed belts or hot bins. Take RAP samples from the RAP system. 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. You may sample from a different project including a non-Department project if the Engineer is allowed to be present during sampling.
 - Prepare 3 briquettes from a single split sample. To verify the JMF for stability, the Engineer tests the 3 briquettes and reports the average of 3 tests. Prepare new briquettes if the range of stability for the 3 briquettes is more than 12 points.
 - If the Engineer verifies the JMF, the Engineer provides you a Form HMA-103.
 - 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 ± 0.3 percent 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 HMA-101 and verification of a plant-produced sample.
- The Engineer reverifies the JMF if HMA production has stopped for longer than 30 days and the verified JMF is older than 12 months.

39-1.03F 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 in writing to the Engineer within 3 days of a request except when Quality Control / Quality Assurance is specified.

39-1.04B PREPAVING CONFERENCE

- You must 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 2250 kg. Use an AASHTO-certified laboratory for testing.
 - Sample and test gradation and wire and fabric content of CRM once per 4500 kg of scrap tire CRM and once per 1500 kg 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 CORES

- For Standard and QC / QA projects, take 100-mm or 150-mm diameter cores at least once every 5 business days. Take 1 core for every 225 tonnes of HMA from random locations the Engineer designates. Take cores in the Engineer's presence and backfill and compact holes with HMA. Before submitting a core to the Engineer, mark it with the core's location and place it in a protective container.
 - If a core is damaged, replace it with a core taken within 0.3 m longitudinally from the original core. Relocate any core located within 0.3 m of a rumble strip to 0.3 m transversely away from the rumble strip.

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. Sampling must be statistically-based and random.
- The Engineer accepts HMA based on:
 1. Accepted JMF
 2. Accepted QCP for Standard and QC / QA
 3. Compliance with the HMA acceptance specifications
 4. Acceptance of a lot for QC / QA
 5. Visual inspection

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 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 680 tonnes 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. 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 for compliance with specifications. You and the Engineer must report test results in writing within 3 business days of sampling.
- For Standard and QC / QA projects, take 100-mm or 150-mm diameter cores within the first 680 tonnes on the first day of HMA production. Take 1 core for every 225 tonnes of HMA at locations the Engineer designates. Take cores in the Engineer's presence and backfill and compact holes with HMA. Before submitting a core to the Engineer, mark it with the core's location and place it in a protective container. For each 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 core locations and include them in your production tests for percent of maximum theoretical density.
- For Standard and QC / QA projects, prepare 3 briquettes from a single split sample. You and the Engineer test for compliance with stability specifications and report the average of 3 tests. Prepare new briquettes if the range of stability for the 3 briquettes is more than 12 points.

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:

1. California Test 109
2. The Department's Materials Plant Qualification 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 135 degrees C and 190 degrees C when mixed with aggregate.
- Asphalt rubber binder must be between 177 degrees C and 218 degrees C when mixed with aggregate.
- Aggregate must not be more than 163 degrees C when mixed with asphalt binder. Aggregate temperature specifications do not apply when you use RAP.

- HMA with or without RAP must not be more than 163 degrees C.

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 pre-mix the asphalt binder and asphalt modifier before adding CRM. If you pre-mix asphalt binder and asphalt modifier, the asphalt binder must be between 177 degrees C and 218 degrees C when you add asphalt modifier. Mix them for at least 20 minutes. When you add CRM, the asphalt binder and asphalt modifier must be between 177 degrees C and 218 degrees C.

- 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 177 degrees C and the lower of 218 degrees C or 6 degrees C 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 177 degrees C, 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 mass. 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 except layers placed the same day
3. Between HMA layers if dirt or other foreign material is present on the surface including HMA layers placed the same day
4. To vertical surfaces of:

- 4.2. Curbs
- 4.3. Gutters
- 4.4. 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 Overlay over:	Minimum Residual Rates (liters per square meter)		
	SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	RS1/RS2 and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 Asphaltic Emulsion
New HMA (between lifts)	0.09	0.14	0.09
Existing HMA and PCC pavement	0.14	0.18	0.14
Planned pavement	0.23	0.27	0.18

Tack Coat Application Rates for OGFC

OGFC over:	Minimum Residual Rates (liters per square meter)		
	SS1/SS1h and QS1h/CQS1h Asphaltic Emulsion	RS and QS1/CQS1 Asphaltic Emulsion	Asphalt Binder and PMRS2/PMCRS2 Asphaltic Emulsion
New HMA	0.14	0.18	0.14
Existing HMA and PCC pavement	0.23	0.27	0.18
Planned pavement	0.27	0.32	0.23

- 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 change tack coat rates.
- 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 140 degrees C and 175 degrees C when applied.

39-1.09D GEOSYNTHETIC PAVEMENT INTERLAYER

- Before placing the geosynthetic pavement interlayer and asphalt binder:
 1. Repair cracks 6 mm 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 1.13 liter ± 0.14 liter of asphalt binder per square meter of interlayer or until the fabric is saturated. Apply asphalt binder the width of the geosynthetic pavement interlayer plus 75 mm on each side. At interlayer overlaps, apply asphalt binder on the lower interlayer the same overlap distance as the upper interlayer.
 - Align and place the interlayer with no overlapping wrinkles, except a wrinkle that overlaps may remain if it is less than 12.5 mm thick. If the overlapping wrinkle is more than 12.5 mm thick, cut the wrinkle out and overlap the interlayer no more than 50 mm.
 - The minimum HMA thickness over the interlayer must be 35 mm thick including conform tapers. Do not place the interlayer on a wet or frozen surface.
 - Overlap the interlayer borders between 50 mm and 100 mm. 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 127 degrees C
- Pave HMA in maximum 75-mm thick compacted layers.
- You may pave HMA in 1 or more layers on areas less than 1.5 m 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 0.15 m 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. Private drives
6. Curve widenings
7. Chain control lanes
8. Turnouts
9. Left turn pockets

- If the number of lanes change, pave each through lane's top layer before paving a changing 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 65 degrees C for HMA with unmodified binder
2. Below 60 degrees C for HMA with modified binder
3. Below 80 degrees C 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.
- If a 19 mm aggregate grading is specified, you may use a 12.5 mm aggregate grading if you place HMA lifts between 38 mm and 60 mm thick.

- Spread and compact HMA under Section 39-3, "Method," if either:

1. Total paved thickness is less than 45 mm.
2. Total paved thickness is less than 60 mm and a 19-mm aggregate grading is specified and used.
3. You spread and compact at:

- 3.1. Digouts
- 3.2. Leveling courses
- 3.3. Detours not included in the final roadway prism
- 3.4. Areas the Engineer determines conventional compaction and compaction measurement methods are impeded

- Do not allow traffic on new HMA pavement until its mid-depth temperature is below 71 degrees C.
- 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 0.5 kg and 1 kg per square meter 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 15 mm 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 3.66-m \pm 0.06-m long straightedge:
 1. More than 3 mm when the straight edge is laid parallel with the centerline
 2. More than 6 mm when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
 3. More than 6 mm when the straightedge is laid within 7.3 m of a pavement conform

39-1.12C PROFILOGRAPH

- Under California Test 526, determine the zero (null) blanking band Profile Index (PI₀) and must-grinds on the top layer of HMA Type A, Type B, and RHMA-G pavement. Take 2 profiles within each traffic lane, 1 m from and parallel with the edge of each lane.
 - A must-grind is a deviation of 7.5 mm or more in a length of 7.5 m. 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 600 m or more, the PI₀ must be at most 75 mm per 160-m section.
 - On horizontal curves with a centerline radius of curvature between 300 m and 600 m including pavement within the superelevation transitions, the PI₀ must be at most 150 mm per 160 m 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 PI₀. You must measure these areas with a 3.6-m straightedge and determine must-grinds with a profilograph:
 1. New HMA with a total thickness less than or equal to 75 mm
 2. Horizontal curves with a centerline radius of curvature less than 300 m including pavement within the superelevation transitions of those curves
 3. Within 3.66 m of a transverse joint separating the pavement from:
 - 3.1. Existing pavement not constructed under the same project
 - 3.2. A bridge deck or approach slab
 4. Exit ramp termini, truck weigh stations, weigh-in-motion areas, and ramps and connectors with steep grades and superelevation rates greater than 6 percent
 5. Turn lanes and areas around manholes or drainage transitions
 6. Acceleration and deceleration lanes for at-grade intersections
 7. Shoulders and miscellaneous areas
 8. HMA pavement with a length of less than 900 m
 9. HMA pavement within 1 m 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 conform to the smoothness specifications, grind the pavement to within tolerances or remove and replace it. Grinding HMA pavement must comply with Section 42-2.02, "Construction."
 - Remove and replace 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 3.66 m of a transverse joint separating the pavement from a bridge deck or approach slab
- Ground 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
 - After grinding, measure the ground HMA pavement surface with a profilograph and a 3.66-m straightedge until the pavement is within specified tolerances. If a must-grind area or straightedged pavement cannot be ground 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

- Miscellaneous areas are outside the traveled way and include:
 1. Median areas not including inside shoulders
 2. Island areas
 3. Sidewalks
 4. Dikes
 5. Gutters
 6. Gutter flares
 7. Ditches
 8. Overside drains
 9. 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 9.5-mm or 12.5-mm HMA Type A and Type B aggregate gradations.
 3. Minimum asphalt binder content must be 6.8 percent for 9.5-mm aggregate and 6.0 percent for 12.5-mm 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.

39-1.14 SHOULDER RUMBLE STRIP

- Construct shoulder rumble strips by rolling or grinding indentations in the top layer of new HMA surfacing.
- 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 50 mm of the specified alignment. Roller or grinding equipment must be equipped with a sighting device enabling the operator to maintain the rumble strip alignment.
 - Rolled-in indentations must not vary from the specified dimensions by more than 10 percent.
 - Ground-in indentations must comply with the specified dimensions within 1.5 mm in depth or 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."
 - On ground areas, apply fog seal coat under Section 37-1, "Seal Coats."

39-2 STANDARD

39-2.01 DESCRIPTION

- If HMA Type A, Type B, RHMA-G, or OGFC 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

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 680 tonnes and any remaining part	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 -0.70
HMA moisture content (max.)	CT 370	1 per 2,250 tonnes but not less than 1 per paving day	1.0%	1.0%	1.0%	1.0%
Percent of maximum theoretical density ^{d,e}	Quality control plan	2 per business day (min.)	91% - 97%	91% - 97%	91% - 97%	--
Stabilometer value ^{c,f,g} (min.) 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	CT 366	One per 3,600 tonnes or 2 per 5 business days, whichever is more	30	30	--	--
			37	35	23	--
Air voids content (%) ^{c,h}	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 ⁱ	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 4.75-mm sieve and retained on 2.38-mm sieve.)	CT 205	As necessary and designated in the QCP. At least once per project	90	25	--	90
			75	--	90	75
			70	20	70	90
Los Angeles Rattler (% max.) Loss at 100 rev. Loss at 500 rev.	CT 211		12 45	-- 50	12 40	12 40

Voids filled with asphalt (%)	LP-3		Report only	Report only	Report only	--
Fine aggregate angularity (% min.)	AASHTO T 304, Method A		Report only	Report only	Report only	--
Flat and elongated particles (% max. @ 5:1)	ASTM D 4791		Report only	Report only	Report only	Report only
Voids in mineral aggregate (% min.)	LP-2		Report only	Report only	Report only	--
Dust proportion	LP-4		Report only	Report only	Report only	--
Smoothness	Section 39-1.12	--	3.66 m straightedge, must-grind, and PI ₀	3.66 m straightedge, must-grind, and PI ₀	3.66 m straightedge, must-grind, and PI ₀	3.66 m straightedge and must-grind
Asphalt rubber binder viscosity @ 177 degrees C, centipoises	Section 39-1.02D	--	--	--	1,500 – 4,000	1,500 – 4,000
Crumb rubber modifier	Section 39-1.02D	--	--	--	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. Required for HMA Type A, Type B, and RHMA-G if the total paved thickness is at least 45 mm.
- e. Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.
- f. Prepare and test a set of 3 briquettes for each stability determination. If the stability range is more than 12 points, prepare and test new briquettes.
- g. Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 degrees C ± 3 degrees C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 60 degrees C for a minimum of 2 hours and not more than 3 hours."
- h. Determine the bulk density of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
- i. For adjusting the plant controller at the HMA plant.
 - 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. Test to confirm compliance with the specifications.
 5. 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 aggregate and HMA for acceptance testing and tests for:

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						19 mm	12.5 mm	9.5 mm	
12.5-mm						X ^b			
9.5-mm							X		
4.75-mm								X	
2.36-mm						X	X	X	
0.075-mm	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 ± 0.5%	JMF +0.50 -0.70				
HMA moisture content (max.)	CT 370	1.0%	1.0%	1.0%	1.0%				
Percent of maximum theoretical density ^{e, f}	CT 375	91% – 97%	91% – 97%	91% – 97%	--				
Stabilometer value ^{d, g, h} (min.)	CT 366	30	30	--	--				
4.75-mm and 9.5-mm gradings									
12.5-mm and 19-mm gradings	37	35	23	--					
Air voids content (%) ^{d, i}	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.)		70	20	70	90				
(Passing 4.75-mm sieve and retained on 2.36-mm sieve.)									
Los Angeles Rattler (% max.)	CT 211								
Loss at 100 rev.						12	--	12	12
Loss at 500 rev.		45	50	40	40				
Voids filled with asphalt (%)	LP-3	Report only	Report only	Report only	--				
Fine aggregate angularity (% min.)	AASHTO T 304, Method A	Report only	Report only	Report only	--				
Flat and elongated particles (% Max. @ 5:1)	ASTM D 4791	Report only	Report only	Report only	Report only				
Voids in mineral aggregate (% min.)	LP-2	Report only	Report only	Report only	--				
Dust proportion	LP-4	Report only	Report only	Report only	--				
Smoothness	Section 39-1.12	3.66-m straightedge, must-grind, and PI ₀	3.66-m straightedge, must-grind, and PI ₀	3.66-m straightedge, must-grind, and PI ₀	3.66-m 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 39-1.02 D	Section 92-1.02 (C) and Section 39-1.02 D				

Asphalt modifier	Various	--	--	Section 39-1.02 D	Section 39-1.02 D
Crumb rubber modifier	Various	--	--	Section 39-1.02 D	Section 39-1.02 D

- 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 percent of maximum theoretical density if the total paved thickness is at least 45 mm under California Test 375 except the Engineer uses:
 1. California Test 308, Method A, to determine in-place density of each core instead of using the nuclear gauge in Part 4, "Determining In-Place Density By The Nuclear Density Device."
 2. California Test 309 to determine maximum theoretical density instead of calculating test maximum density in Part 5, "Determining Test Maximum Density."
- f. The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.
- g. The Engineer prepares and tests a set of 3 briquettes for each stability determination. If the stability range is more than 12 points, the Engineer prepares new briquettes.
- h. Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 degrees C \pm 3 degrees C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 60 degrees C for a minimum of 2 hours and not more than 3 hours."
- i. The Engineer determines the bulk density of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
 - No single test result may represent more than the smaller of 680 tonnes 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 core you take from each 225 tonnes of HMA production. The Engineer determines the percent of maximum theoretical density for each core by determining the core's density and dividing by the maximum theoretical density.
 - If the total paved thickness is at least 45 mm and any lift is less than 45 mm, the Engineer determines the percent of maximum theoretical density from cores taken from the final lift measured the full depth of the total paved HMA thickness.
 - 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 Type A, Type B, RHMA-G, or OGFC 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 aggregate and HMA for acceptance testing and tests for:

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 ± 0.5%	JMF +0.50 -0.70
HMA moisture content (max.)	CT 370	1.0%	1.0%	1.0%	1.0%
Stabilometer value ^{c, d, e} (min.)	CT 366				
4.75-mm and 9.5-mm gradings		30	30	--	--
12.5-mm and 19-mm gradings		37	35	23	--
Percent of crushed particles	CT 205				
Coarse aggregate (% min.)		90	25	--	90
One fractured face		75	--	90	75
Two fractured faces					
Fine aggregate (% min)		70	20	70	90
(Passing 4.75-mm sieve and retained on 2.36-mm sieve.)					
Los Angeles Rattler (% max.)	CT 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Air voids content (%) ^{e, f}	CT 367	4 ± 2%	4 ± 2%	Specification ± 2%	--
Voids filled with asphalt (%)	LP-3	Report only	Report only	Report only	--
Fine aggregate angularity (% min.)	AASHTO T 304, Method A	Report only	Report only	Report only	--
Flat and elongated particles (% Max. @ 5:1)	ASTM D 4791	Report only	Report only	Report only	Report only
Voids in mineral aggregate (% Min.)	LP-2	Report only	Report only	Report only	--
Dust proportion	LP-4	Report only	Report only	Report only	--
Smoothness	Section 39-1.12	3.66-m straightedge and must-grind	3.66-m straightedge and must-grind	3.66-m straightedge and must-grind	3.66-m 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 39-1.02 D	Section 92-1.02 (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. 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. The Engineer prepares and tests a set of 3 briquettes for each stability determination. If the stability range is more than 12 points, the Engineer prepares and tests new briquettes.
- e. Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 degrees C \pm 3 degrees C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 60 degrees C for a minimum of 2 hours and not more than 3 hours."
- f. The Engineer determines the bulk density of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.
 - No single test result may represent more than the smaller of 680 tonnes 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 mass must be at least 6.8 tonnes.
 2. One oscillating type pneumatic-tired roller at least 1.2 m wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 415 kilopascals minimum and maintained so that the air pressure does not vary more than 35 kilopascals.
 3. One steel-tired, 2-axle tandem roller. The roller's gross static weight must be at least 6.8 tonnes.
- 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 at least 2 steel-tired, 2-axle tandem rollers for each paver. Each roller must weigh between 2250 kilograms to 3075 kilograms per linear meter of drum width.

39-3.04 TRANSPORTING, SPREADING, AND COMPACTING

- 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, mm	Minimum Atmospheric and Surface Temperatures			
	Atmospheric, ° C		Surface, ° C	
	Unmodified Asphalt Binder	Modified Asphalt Binder ^a	Unmodified Asphalt Binder	Modified Asphalt Binder ^a
<45	12.8	10.0	15.6	12.8
45 – 75	7.2	7.2	10.0	10.0

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 120 degrees C
 - 1.2. Breakdown and intermediate compaction before the surface temperature drops below 95 degrees C
 - 1.3. Finish compaction before the surface temperature drops below 65 degrees C

2. Modified asphalt binder, complete:
 - 2.1. First coverage of breakdown compaction before the surface temperature drops below 115 degrees C
 - 2.2. Breakdown and intermediate compaction before the surface temperature drops below 85 degrees C
 - 2.3. Finish compaction before the surface temperature drops below 60 degrees C
 - For RHMA-G:
 1. Only spread and compact if the atmospheric temperature is at least 12.8 degrees C and the surface temperature is at least 15.6 degrees C.
 2. Complete the first coverage of breakdown compaction before the surface temperature drops below 140 degrees C.
 3. Complete breakdown and intermediate compaction before the surface temperature drops below 120 degrees C.
 4. Complete finish compaction before the surface temperature drops below 95 degrees C.
 5. If the atmospheric temperature is below 21 degrees C, 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 12.8 degrees C and the surface temperature is at least 15.6 degrees C.
 2. Complete first coverage using 2 rollers before the surface temperature drops below 115 degrees C.
 3. Complete all compaction before the surface temperature drops below 95 degrees C.
 4. If the atmospheric temperature is below 21 degrees C, 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 10 degrees C and the surface temperature is at least 10 degrees C.
 2. Complete first coverage using 2 rollers before the surface temperature drops below 115 degrees C.
 3. Complete all compaction before the surface temperature drops below 85 degrees C.
 4. If the atmospheric temperature is below 21 degrees C, 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 12.8 degrees C and surface temperature is at least 15.6 degrees C.
 2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 140 degrees C.
 3. Complete compaction before the surface temperature drops below 120 degrees C.
 4. If the atmospheric temperature is below 21 degrees C, 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 kilometers per hour must not exceed the vibrations per minute divided by 1600. If the HMA layer thickness is less than 25 mm, turn the vibrator off. The Engineer may order fewer coverages if the HMA layer thickness is less than 45 mm.
 - 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 8 kilometers per hour.
 - 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 with the vibrator turned off.

39-4 QUALITY CONTROL / QUALITY ASSURANCE

39-4.01 DESCRIPTION

- If HMA Type A, Type B, or RHMA-G 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 you:
 1. Complete 20 sublots
 2. Change the JMF
 3. Stop production for more than 30 days
 4. Stop production and the Engineer terminates the lot because:
 - 4.1. A lot's composite quality factor, QF_C , or an individual quality factor, QF_{QC_i} for $i = 3, 4, \text{ or } 5$, is below 0.90 determined under Section 39-4.03F, "Statistical Evaluation"
 - 4.2. An individual quality factor, QF_{QC_i} for $i = 1 \text{ or } 2$, is below 0.75 for the last 5 tests
- Each lot consists of no more than 20 sublots. A subplot is 680 tonnes except HMA paved at day's end greater than 225 tonnes is a subplot. If HMA paved at day's end is less than 225 tonnes, you may either make this quantity a subplot or include it in the previous subplot's test results for statistical evaluation.

39-4.03 CONTRACTOR QUALITY CONTROL

39-4.03A GENERAL

- Use a composite quality control factor, QF_C , and individual quality control factors, QF_{QC_i} , to control your process and evaluate quality control program. For quality characteristics without quality control 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 and Quality Assurance Manual for Asphalt Concrete 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 and Quality Assurance Manual for Asphalt Concrete 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	Minimum Sampling and Testing Frequency	HMA Type			Location of Sampling	Maximum Reporting Time Allowance
			A	B	RHMA-G		
Aggregate gradation ^a	CT 202	1 per 680 tonnes	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	
Percent of maximum 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 production	--	--	--	Stock-piles or cold feed belts	--
Sand equivalent ^f (min.)	CT 217	1 per 680 tonnes	47	42	47	CT 125	24 hours
HMA moisture content (max.)	CT 370	1 per 2250 tonnes 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 ^{f, g, h} (min.) 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings	CT 366	1 per 3600 tonnes or 2 per 5 business days, whichever is more	30	30	--		48 hours
			37	35	23		
Air voids content (%) ^{f, i}	CT 367		4 ± 2%	4 ± 2%	Specification ± 2%		

Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces	CT 205	As necessary and designated in QCP. At least once per project.	90	25	--	CT 125	48 hours	
Fine aggregate (% min) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.)			75	--	90			
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.)	AASHTO T 304, Method A		Report only	Report only	Report only	CT 125		
Flat and elongated particle (% max. @ 5:1)	ASTM D 4791					CT 125		
Voids in mineral aggregate (% min.)	LP-2					LP-2		
Voids filled with asphalt (%)	LP-3					LP-3		
Dust proportion	LP-4				LP-4			
Smoothness	Section 39-1.12	--	3.66-m straight-edge, must-grind, and PI ₀	3.66-m straight-edge, must-grind, and PI ₀	3.66-m straight-edge, must-grind, and PI ₀	--		
Asphalt rubber binder viscosity @ 177 degrees C, 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. Required for HMA Type A, Type B, and RHMA-G if the total paved thickness is at least 45 mm.
- d. Determine maximum theoretical density (California Test 309) at the frequency specified for test maximum density under California Test 375, Part 5 D.
- e. For adjusting the plant controller at the HMA plant.
- f. Report the average of 3 tests from a single split sample.
- g. Prepare and test a set of 3 briquettes for each stability determination. If the stability range is more than 12 points, prepare and test new briquettes.
- h. Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 degrees C ± 3 degrees C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 60 degrees C for a minimum of 2 hours and not more than 3 hours."
- i. Determine the bulk density of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

- 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."

- For any quality characteristic for which a quality control factor, QF_{QCi} , is not determined, 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. Test and confirm compliance with the specifications.
5. Demonstrate compliance with the specifications before resuming production and placement on the State highway.

39-4.03D CHARTS AND RECORDS

- Record sampling and testing results for quality control on forms provided in the Department's Quality Control and Quality Assurance Manual for Asphalt Concrete Production and Placement, 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, Pavement Asphalt Concrete Reporting System.

39-4.03E RECORDS OF INSPECTION AND TESTING

- During HMA production, submit in writing a daily:

1. Asphalt Concrete Construction Daily Record of Inspection. Also make this record available at the HMA plant and job site each day.
2. Asphalt Concrete Inspection and Testing Summary. Include in the summary:
 - 2.1. Test forms with the testers' signatures and Quality Control Manager's initials.
 - 2.2. Inspection forms with the inspectors' signatures and Quality Control Manager's initials.
 - 2.3. A list and explanation of deviations from the specifications or regular practices.
 - 2.4. 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_{QCs} , for HMA paved in:

1. Areas where the total paved thickness is less than 45 mm
2. Areas where the total paved thickness is less than 60 mm and a 19-mm grading is specified and used
3. Dig outs
4. Leveling courses
5. Detours not part of the finished roadway prism
6. 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. The number of significant figures used in the calculations must comply with AASHTO R-11, Absolute Method.
- Determine the percentage of work not in compliance with the specification limits for each quality characteristic as follows:

1. Calculate the arithmetic mean (\bar{X}) of the test values

$$\bar{X} = \frac{\sum x}{n}$$

where:

- x = individual test values
- n = number of test values, where n is:
 1. For quality control, not more than 20 quality control tests
 2. For Engineer's acceptance, 3 quality assurance tests or 1 quality assurance test for every 5 quality control tests, whichever is more.

2. Calculate the standard deviation

$$s = \sqrt{\frac{n(\sum x^2) - (\sum x)^2}{n(n-1)}}$$

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, where n is:
 1. For quality control, not more than 20 quality control tests
 2. For Engineer's acceptance, 3 quality assurance tests or 1 quality assurance test for every 5 quality control tests, whichever is more.

3. Calculate the upper quality index (Q_u)

$$Q_u = \frac{USL - \bar{X}}{s}$$

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 (Q_L);

$$Q_L = \frac{\bar{X} - LSL}{s}$$

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

$$\text{Percent defective} = P_U + P_L$$

- 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_{QC_i} , using percent defective = $P_U + P_L$ and:

Quality Factor	Quality Factors												
	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
Reject	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
	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:

- 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_{QC_i} = 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
- The Engineer takes HMA and aggregate samples during production and splits each sample into 4 parts. The Engineer tests 1 part to verify quality control test results, submits 1 part to you, and reserves and stores 2 parts.

Verification

- For aggregate gradation and asphalt binder content, the ratio of verification testing frequency to the minimum 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 sequential sublots for the comparison. When there are less than 20 sequential sublots, the Engineer uses the maximum number of sequential sublots available. For 20 sequential sublots or more, the Engineer uses a moving average and standard deviation of the last 20 sequential sublots.
- The t-value for a group of test data is computed as follows:

$$t = \frac{|\bar{X}_c - \bar{X}_v|}{S_p \sqrt{\frac{1}{n_c} + \frac{1}{n_v}}} \quad \text{and} \quad S_p^2 = \frac{S_c^2(n_c - 1) + S_v^2(n_v - 1)}{n_c + n_v - 2}$$

where:

- n_c = Number of quality control tests (2 minimum, 20 maximum).
 n_v = Number of verification tests (minimum of 1 required).
 \bar{X}_c = Mean of quality control tests.
 \bar{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 $\alpha = 0.025$)	Degrees of freedom (n_c+n_v-2)	t_{crit} (for $\alpha = 0.025$)
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 \bar{X}_v and \bar{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. $|\bar{X}_v - \bar{X}_c| \leq 1.0$ percent for any grading
2. $|\bar{X}_v - \bar{X}_c| \leq 0.1$ percent for asphalt binder content

- If the t-value computed is greater than t_{crit} and the $|\bar{X}_v - \bar{X}_c|$ for grading and 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 GENERAL

- The Engineer samples aggregate and HMA 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					CT 202	JMF ± Tolerance ^c		
	Sieve	19-mm	12.5-mm	9.5-mm					
1	12.5-mm	X ^b	--	--	0.05				
1	9.5-mm	--	X	--	0.05				
1	4.75-mm	--	--	X	0.05				
2	2.36-mm	X	X	X	0.10				
3	0.075-mm	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	Percent of maximum 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 ^{f,g,h} (min.) 4.75-mm and 9.5-mm gradings 12.5-mm and 19-mm gradings					CT 366	30 37	30 35	-- 23
	Air voids content (%) ^{i,1}					CT 367	4 ± 2%	4 ± 2%	Specification ± 2%
	Percent of crushed particles coarse aggregate (% min.) One fractured face Two fractured faces Fine aggregate (% min.) (Passing 4.75-mm sieve and retained on 2.36-mm sieve.)					CT 205	90 70 70	25 -- 20	-- 90 70
	HMA moisture content (max.)					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 45
	Fine aggregate angularity (% min.)					AASHTO T 304, Method A	Report only	Report only	Report only
	Flat and elongated particle (% max. @ 5:1)					ASTM D 4791	Report only	Report only	Report only
	Voids in mineral aggregate (% min.)					LP-2	Report only	Report only	Report only
	Voids filled with asphalt (%)					LP-3	Report only	Report only	Report only
	Dust proportion					LP-4	Report only	Report only	Report only
	Smoothness					Section 39-1.12	3.66-m straight-edge, must-grind, and PI ₀	3.66-m straight-edge, must-grind, and PI ₀	3.66-m 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 percent of maximum theoretical density if the total paved thickness is at least 45 mm under California Test 375 except the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each core instead of using the nuclear gauge in Part 4, "Determining In-Place Density By The Nuclear Density Device."
2. California Test 309 to determine maximum theoretical density instead of calculating test maximum density in Part 5, "Determining Test Maximum Density."

- e. The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.
- f. The Engineer reports the average of 3 tests from a single split sample.
- g. The Engineer prepares and tests a set of 3 briquettes for each stability determination. If the stability range is more than 12 points, the Engineer prepares new briquettes.
- h. Modify California Test 304, Part 2.B.2.c: "After compaction in the mechanical compactor, cool to 60 degrees C \pm 3 degrees C by allowing the briquettes to cool at room temperature for 0.5 hour, then place the briquettes in the oven at 60 degrees C for a minimum of 2 hours and not more than 3 hours."
- i. The Engineer determines the bulk density of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

- The Engineer determines the percent of maximum theoretical density from the average density of 3 cores you take from every 680 tonnes of production or part thereof divided by the maximum theoretical density.
 - If the total paved thickness is at least 45 mm and any lift is less than 45 mm, the Engineer determines the percent of maximum theoretical density from cores taken from the final lift measured the full depth of the total paved HMA thickness.
 - For any single quality characteristic for which a quality control 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_{QC_i} 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 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_{QC_i} , determined for each quality characteristic in the table "HMA Acceptance – QC / QA" in Section 39-4.05A, "General."
- 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_{QC_i} for $i = 3, 4,$ and 5, is 0.90 or greater
 3. Each individual quality factor, QF_{QC_i} for $i = 1$ and 2, is 0.75 or greater
- No single quality characteristic test may represent more than the smaller of 680 tonnes or 1 day's production.

Payment Adjustment

- If a lot is accepted, the Engineer adjusts payment with the following formula:

$$PA = \sum_{i=1}^n HMA CP * w_i * [QF_{QC_i} * (HMATT - WHMATT_i) + WHMATT_i] - (HMA CP * HMATT)$$

where:

PA =	Payment adjustment rounded to 2 decimal places.
HMA CP =	HMA contract price.
HMATT =	HMA total tonnes represented in the lot.
WHMATT _i =	Total tons of waived quality characteristic HMA.
QF _{QC_i} =	Running quality factor for the individual quality characteristic. QF _{QC_i} for $i = 1$ through 4 must be from verified Contractor's QC results. QF _{QC5} must be determined from the Engineer's results on 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.
- When the 21st sequential subplot becomes the 1st subplot in the moving average, 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. The 21st subplot becomes the 1st subplot ($n = 1$) in the next lot. If the next lot consists of less than 5 sublots, these sublots must be added to the previous sublots for quality factor determination using 21 to 24 sublots.

39-4.05C DISPUTE RESOLUTION

- For percent of maximum theoretical density dispute resolution:
 1. Referee tests must be performed under the specifications for acceptance testing.
 2. The quality factor, QF_{QC5} , must be determined using the referee tests.
 3. If QF_{QC5} using the referee tests is less than or equal to ± 1 percent of the original quality factor, the original test result is correct.
 4. If QF_{QC5} using the referee tests is more than ± 1 percent of the original quality factor, the quality factors determined from the referee tests supersede previously determined quality factors.
- For dispute resolution for aggregate gradation and asphalt binder content:

1. The disputing party determines the sublots to dispute. The disputed sublots must have at least 5 quality control tests and at least 1 associated acceptance test.
2. If any quality factor, QF_{QC_i} for $i = 1$ through 4, using the referee tests is less than or equal to ± 1 percent of the original quality factor, the original test result is correct.
3. If any quality factor, QF_{QC_i} for $i = 1$ through 4, using referee tests is more than ± 1 percent of the original quality factor, the quality factors determined from the referee tests supersede previously determined quality factors.

39-5 MEASUREMENT AND PAYMENT

39-5.01 MEASUREMENT

- The contract item price for HMA is measured by mass. The mass of each HMA mixture designated in the Engineer's Estimate must be the combined mixture mass.

- If asphalt binder and asphaltic emulsion are paid with separate contract items, their contract item prices are measured under Section 92, "Asphalts," or Section 94, "Asphaltic Emulsions," as the case may be.

- If recorded batch masses are printed automatically, the contract item price for HMA is measured by using the printed batch masses, provided:

1. Total aggregate and supplemental fine aggregate mass per batch is printed. If supplemental fine aggregate is weighed cumulatively with the aggregate, the total aggregate batch mass must include the supplemental fine aggregate mass.
2. Total asphalt binder mass per batch is printed.
3. Each truckload's zero tolerance mass 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 masses is certified by a licensed weighmaster and submitted to the Engineer.

- The contract item price for placing HMA dike is measured by the linear meter along the completed length. The contract item price for placing HMA in miscellaneous areas is measured as the in-place compacted area in square meters. In addition to the quantities measured on a linear foot or square meter basis, the HMA for dike and miscellaneous areas are measured by mass.

- The contract item price 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.

- The contract item price for geosynthetic pavement interlayer is measured by the square meter for the actual pavement area covered.

39-5.02 PAYMENT

- The contract item prices paid per tonne 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 prepping conference shall be considered as included in the contract prices paid per tonne 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 shall be considered as included in the contract prices paid per tonne for HMA as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

- Full compensation for reclaimed asphalt pavement shall be considered as included in the contract prices paid per tonne for HMA as designated in the Engineer's Estimate and no additional compensation will be allowed therefor.

- The contract item price paid per tonne 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 contract item prices paid per station for rumble strips 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 rumble strips, including fog seal 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 State will pay for HMA dike at the contract item price per linear meter for place HMA dike and by the tonne for HMA. The contract item prices paid per linear meter 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 will pay for HMA specified to be a miscellaneous area at the contract item price per square meter for place hot mix asphalt (miscellaneous area) and per tonne for hot mix asphalt. The contract item price paid per square meter 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 will be paid for at the contract price per tonne for hot mix asphalt under Section 39-4, "Quality Control / Quality Assurance." Section 39-4.05B, "Statistical Evaluation, Determination of Quality Factors and Acceptance," shall 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) shall be considered as included in the contract item price paid per tonne for the hot mix asphalt designated in the Engineer's Estimate and no separate payment will be made therefor.
- The contract item price paid per square meter for geosynthetic pavement interlayer 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 item price paid per tonne 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 shall be considered as included in the contract item price paid per tonne for the HMA being paved over the interlayer and no separate payment will be made therefor.
- The contract item price paid per tonne 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.
- If there is no item for tack coat and the work is specified, full compensation for tack coat shall be considered as included in the contract item price paid per tonne for hot mix asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.
- The Engineer will 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 shall be considered as included in the contract item price paid per tonne 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 shall be considered as included in the contract item price paid per tonne for rubberized hot mix asphalt as designated in the Engineer's Estimate and no separate payment will be made therefor.
- If the Engineer fails to comply with a specification within a specified time, and if, in the opinion of the Engineer, work completion is delayed because of the failure, the Engineer adjusts payment and contract time under Section 8-1.09, "Right of Way Delays."
- 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 Engineer adjusts payment and contract time under Section 8-1.09, "Right of Way Delays."

SECTION 40: PORTLAND CEMENT CONCRETE PAVEMENT

Issue Date: January 5, 2007

Section 40-1.015, "Cement Content," is deleted.

Section 40-1.05, "Proportioning," of the Standard Specifications is amended to read:

- Aggregate and cementitious material proportioning shall conform to the provisions in Section 90-5, "Proportioning."

The first paragraph in Section 40-1.105, "Exit Ramp Termini," of the Standard Specifications is amended to read:

- Concrete pavement shall be constructed at the ends of exit ramps when required by the plans or the special provisions. Texturing for exit ramp termini shall be by means of heavy brooming in a direction normal to ramp centerline. The hardened surface shall have a coefficient of friction not less than 0.35 as determined by California Test 342. Minimum cementitious material content of concrete in pavement for exit ramp termini shall be 350 kg/m³.

The fourth paragraph of Section 40-1.08, "Joints," of the Standard Specifications is amended to read:

- Straight tie bars shall be deformed reinforcing steel bars conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420; ASTM Designation: A 996/A 996M, Grade 350 or 420; or ASTM Designation: A 706/A 706M.

The first paragraph in Section 40-1.14, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per cubic meter for concrete pavement shall include full compensation for furnishing all labor, materials (including cementitious material in the amount specified), tools, equipment, and incidentals, and for doing all the work involved in constructing the portland cement concrete pavement, complete in place, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

SECTION 41: PAVEMENT SUBSEALING AND JACKING

Issue Date: January 5, 2007

The second paragraph of Section 41-1.02, "Materials," of the Standard Specifications is amended to read:

- Cement for grout shall be Type II portland cement conforming to the provisions in Section 90-2.01A, "Cement."

The third paragraph of Section 41-1.02, "Materials," of the Standard Specifications is amended to read:

- 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."

The fifth paragraph of Section 41-1.02, "Materials," of the Standard Specifications is amended to read:

- 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

Issue Date: December 31, 2001

The last sentence of the first subparagraph of the third paragraph in Section 42-2.02, "Construction," of the Standard Specifications is amended to read:

- After grinding has been completed, the pavement shall conform to the straightedge and profile requirements specified in Section 40-1.10, "Final Finishing."

SECTION 49: PILING

Issue Date: January 5, 2007

The first paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Foundation piles of any material shall be of such length as is required to obtain the specified penetration, and to extend into the cap or footing block as shown on the plans, or specified in the special provisions.

The fourth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Modification to the specified installation methods and specified pile tip elevation will not be considered at locations where tension or lateral load demands control design pile tip elevations or when the plans state that specified pile tip elevation shall not be revised.

The sixth and seventh paragraphs in Section 49-1.03, "Determination of Length," of the Standard Specifications are amended to read:

- Indicator compression pile load testing shall conform to the requirements in ASTM Designation: D 1143-81. The pile shall sustain the first compression test load applied which is equal to the nominal resistance in compression, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.

- Indicator tension pile load testing shall conform to the requirements in ASTM Designation: D 3689-90. The loading apparatus described as "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" shall not be used. The pile shall sustain the first tension test load applied which is equal to the nominal resistance in tension, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.

The ninth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- For driven piling, the Contractor shall furnish piling of sufficient length to obtain the specified tip elevation shown on the plans or specified in the special provisions. For cast-in-drilled-hole concrete piling, the Contractor shall construct piling of such length to develop the nominal resistance in compression and to obtain the specified tip elevation shown on the plans or specified in the special provisions.

The tenth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is deleted.

The fourth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

- Load test piles and anchor piles which are not to be incorporated in the completed structure shall be removed in conformance with the provisions in Section 15-4.02, "Removal Methods," and the remaining holes shall be backfilled with earth or other suitable material approved by the Engineer.

The fifth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

- Load test anchorages in piles used as anchor piles shall conform to the following requirements:
 - A. High strength threaded steel rods shall conform to the provisions for bars in Section 50-1.05, "Prestressing Steel," except Type II bars shall be used.
 - B. High strength steel plates shall conform to the requirements in ASTM Designation: A 709/A 709M, Grade 345.
 - C. Anchor nuts shall conform to the provisions in the second paragraph in Section 50-1.06, "Anchorages and Distribution."

The sixth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

- The Contractor may use additional cementitious material in the concrete for the load test and anchor piles.

The first paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

- Driven piles shall be installed with impact hammers that are approved in writing by the Engineer. Impact hammers shall be steam, hydraulic, air or diesel hammers. Impact hammers shall develop sufficient energy to drive the piles at a penetration rate of not less than 3 mm per blow at the specified nominal resistance.

The seventh paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

- When necessary to obtain the specified penetration and when authorized by the Engineer, the Contractor may supply and operate one or more water jets and pumps, or furnish the necessary drilling apparatus and drill holes not greater than the least dimension of the pile to the proper depth and drive the piles therein. Jets shall not be used at locations where the stability of embankments or other improvements would be endangered. In addition, for steel piles, steel shells, or steel casings, when necessary to obtain the specified penetration or to prevent damage to the pile during installation, the Contractor shall provide special driving tips or heavier pile sections or take other measures as approved by the Engineer.

- The use of followers or underwater hammers for driving piles will be permitted if authorized in writing by the Engineer. When a follower or underwater hammer is used, its efficiency shall be verified by furnishing the first pile in each bent or footing sufficiently long and driving the pile without the use of a follower or underwater hammer.

The second paragraph in Section 49-1.07, "Driving," of the Standard Specifications is amended to read:

- Timber piles shall be fresh-headed and square and when permitted by the Engineer, the heads of the piles may be protected by means of heavy steel or wrought iron rings. During driving operations timber piling shall be restrained from lateral movement at intervals not to exceed 6 m over the length between the driving head and the ground surface. During driving operations, the timber pile shall be kept moving by continuous operation of the hammer. When the blow count exceeds either 2 times the blow count required in 300 mm, or 3 times the blow count required in 75 mm for the nominal resistance as shown on the plans, computed in conformance with the provisions in Section 49-1.08, "Pile Driving Acceptance Criteria," additional aids shall be used to obtain the specified penetration. These aids may include the use of water jets or drilling, where permitted, or the use of a larger hammer employing a heavy ram striking with a low velocity.

Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications is amended to read:

49-1.08 PILE DRIVING ACCEPTANCE CRITERIA

- Except for piles to be load tested, driven piles shall be driven to a value of not less than the nominal resistance shown on the plans unless otherwise specified in the special provisions or permitted in writing by the Engineer. In addition, when a pile tip elevation is specified, driven piles shall penetrate at least to the specified tip elevation, unless otherwise permitted in writing by the Engineer. Piles to be load tested shall be driven to the specified tip elevation.
 - When the pile nominal resistance is omitted from the plans or the special provisions, timber piles shall be driven to a nominal resistance of 800 kN, and steel and concrete piles shall be driven to a nominal resistance of 1250 kN.
 - The nominal resistance for driven piles shall be determined from the following formula in which "R_u" is the nominal resistance in kilonewtons, "E_r" is the manufacturer's rating for joules of energy developed by the hammer at the observed field drop height, and "N" is the number of hammer blows in the last 300 millimeters. (maximum value to be used for N is 100):

$$R_u = (7 * (E_r)^{1/2} * \log_{10} (0.83 * N)) - 550$$

The first paragraph in Section 49-2.03, "Requirements," of the Standard Specifications is amended to read:

- When preservative treatment of timber piles is required by the plans or specified in the special provisions, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and the applicable AWWA Use Category.

The first paragraph in Section 49-2.04, "Treatment of Pile Heads," of the Standard Specifications is amended to read:

- A. An application of wood preservative conforming to the provisions in Section 58-1.04, "Wood Preservative for Manual Treatment," shall first be applied to the head of the pile and a protective cap shall then be built up by applying alternate layers of loosely woven fabric and hot asphalt or tar similar to membrane waterproofing, using 3 layers of asphalt or tar and 2 layers of fabric. The fabric shall measure at least 150 mm more in each direction than the diameter of the pile and shall be turned down over the pile and the edges secured by binding with 2 turns of No. 10 galvanized wire. The fabric shall be wired in advance of the application of the final layer of asphalt or tar, which shall extend down over the wiring.
- B. The sawed surface shall be covered with 3 applications of a hot mixture of 60 percent creosote and 40 percent roofing pitch, or thoroughly brushcoated with 3 applications of hot creosote and covered with hot roofing pitch. A covering of 3.50-mm nominal thickness galvanized steel sheet shall be placed over the coating and bent down over the sides of each pile to shed water.

Section 49-3.01, "Description," of the Standard Specifications is amended by deleting the fifth paragraph.

The sixth and seventh paragraphs in Section 49-3.01, "Description," of the Standard Specifications are amended to read:

- Except for precast prestressed concrete piles in a corrosive environment, lifting anchors used in precast prestressed concrete piles shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."
- Lifting anchors used in precast prestressed concrete piles in a corrosive environment shall be removed to a depth of at least 25 mm below the surface of the concrete, and the resulting hole shall be filled with epoxy adhesive before the piles are delivered to the job site. The epoxy adhesive shall conform to the provisions in Sections 95-1, "General," and 95-2.01, "Binder (Adhesive), Epoxy Resin Base (State Specification 8040-03)."

The first and second paragraphs in Section 49-4.01, "Description," of the Standard Specifications are amended to read:

- Cast-in-place concrete piles shall consist of one of the following:
 - A. Steel shells driven permanently to the required nominal resistance and penetration and filled with concrete.
 - B. Steel casings installed permanently to the required penetration and filled with concrete.
 - C. Drilled holes filled with concrete.
 - D. Rock sockets filled with concrete.
- The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm 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."

The fourth paragraph in Section 49-4.03, "Drilled Holes," of the Standard Specifications is amended to read:

- After placing reinforcement and prior to placing concrete in the drilled hole, if caving occurs or deteriorated foundation material accumulates on the bottom of the hole, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

The first and second paragraphs in Section 49-4.04, "Steel Shells," of the Standard Specifications are amended to read:

- Steel shells shall be sufficiently watertight to exclude water during the placing of concrete. The shells may be cylindrical or tapered, step-tapered, or a combination of either, with cylindrical sections.

The first paragraph in Section 49-4.05, "Inspection," of the Standard Specifications is amended to read:

- After being driven and prior to placing reinforcement and concrete therein, the steel shells shall be examined for collapse or reduced diameter at any point. Any shell which is improperly driven or broken or shows partial collapse to such an extent as to materially decrease its nominal resistance will be rejected. Rejected shells shall be removed and replaced, or a new shell shall be driven adjacent to the rejected shell. Rejected shells which cannot be removed shall be filled with concrete by the Contractor at the Contractor's expense. When a new shell is driven to replace a rejected shell, the Contractor, at the Contractor's expense, shall enlarge the footing as determined necessary by the Engineer.

The third paragraph in Section 49-5.01, "Description," of the Standard Specifications is amended to read:

- Steel pipe piles shall conform to the following requirements:
 1. Steel pipe piles less than 360 mm in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 2 or 3.
 2. Steel pipe piles 360 mm and greater in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 3.
 3. Steel pipe piles shall be of the nominal diameter and nominal wall thickness shown on the plans or specified in the special provisions.
 4. The carbon equivalency (CE) of steel for steel pipe piles, as defined in AWS D 1.1, Section XI5.1, shall not exceed 0.45.
 5. The sulfur content of steel for steel pipe piles shall not exceed 0.05-percent.
 6. Seams in steel pipe piles shall be complete penetration welds.

The first paragraph in Section 49-6.01, "Measurement," of the Standard Specifications is amended to read:

- 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 the greater of the following:
 - A. The total length in place in the completed work, measured along the longest side, from the tip of the pile to the plane of pile cut-off.
 - B. The length measured along the longest side, from the tip elevation shown on the plans or the tip elevation ordered by the Engineer, to the plane of pile cut-off.

The third paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per meter for cast-in-drilled-hole concrete piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in drilling holes, disposing of material resulting from drilling holes, temporarily casing holes and removing water when necessary, furnishing and placing concrete and reinforcement, and constructing reinforced concrete extensions, complete in place, to the required penetration, as shown on the plans, as specified in these specifications and in the special provisions, and as directed by the Engineer.

The seventh paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- The contract unit price paid for drive pile shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in driving timber, concrete and steel piles, driving steel shells for cast-in-place concrete piles, placing filling materials for cast-in-place concrete piles and cutting off piles, all complete in place to the required nominal resistance and penetration as shown on the plans and as specified in these specifications and the special provisions, and as directed by the Engineer.

The ninth paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- Full compensation for all jetting, drilling, providing special driving tips or heavier sections for steel piles or shells, or other work necessary to obtain the specified penetration and nominal resistance of the piles, for predrilling holes through embankment and filling the space remaining around the pile with sand or pea gravel, for disposing of material resulting from jetting, drilling or predrilling holes, and for all excavation and backfill involved in constructing concrete extensions as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid for drive pile or in the contract price paid per meter for cast-in-drilled-hole concrete piling, and no additional compensation will be allowed therefor.

Section 49-6.02, "Payment," of the Standard Specifications is amended by adding the following paragraphs:

- Full compensation for furnishing and placing additional testing reinforcement, for load test anchorages, and for cutting off test piles, shall be considered as included in the contract price paid for piling of the type or class shown in the Engineer's Estimate, and no additional compensation will be allowed.

- No additional compensation or extension of time will be made for additional foundation investigation, installation and testing of indicator piling, cutting off piling and restoring the foundation investigation and indicator pile sites, and review of request by the Engineer.

SECTION 50: PRESTRESSING CONCRETE

Issue Date: January 4, 2008

Section 50-1.02, "Drawings," of the Standard Specifications is amended by adding the following paragraph after the second paragraph:

- Each working drawing submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate working drawing submittal.

The eighth paragraph of Section 50-1.02, "Drawings," of the Standard Specifications is deleted.

Section 50-1.05, "Prestressing Steel," of the Standard Specifications is amended to read:

- 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 high-strength steel bars conforming to the requirements in ASTM Designation: A 722, including all supplementary requirements. The maximum mass requirement of ASTM Designation: A 722 will not apply.

- In addition to the requirements of ASTM Designation: A 722, for deformed bars, the reduction of area shall be determined from a bar from which the deformations have been removed. The bar shall be machined no more than necessary to remove the deformations over a length of 300 mm, and reduction will be based on the area of the machined portion.

- In addition to the requirements specified herein, epoxy-coated seven-wire prestressing steel strand shall be grit impregnated and filled in conformance with the requirements in ASTM Designation: A 882/A 882M, including Supplement I, and the following:

- A. The coating material shall be on the Department's list of approved coating materials for epoxy-coated strand, available from the Transportation Laboratory.
- B. The film thickness of the coating after curing shall be 381 μm to 1143 μm .
- C. Prior to coating the strand, the Contractor shall furnish to the Transportation Laboratory a representative 230-g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.
- D. Prior to use of the epoxy-coated strand in the work, written certifications referenced in ASTM Designation: A 882/A 882M, including a representative load-elongation curve for each size and grade of strand to be used and a copy of the quality control tests performed by the manufacturer, shall be furnished to the Engineer.
- E. In addition to the requirements in Section 50-1.10, "Samples for Testing," four 1.5-m long samples of coated strand and one 1.5-m 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.
- F. Epoxy-coated strand shall be cut using an abrasive saw.
- G. All visible damage to coatings caused by shipping and handling, or during installation, including cut ends, shall be repaired in conformance with the requirements in ASTM Designation: A 882/A 882M. The patching material shall be furnished by the manufacturer of the epoxy powder and shall be applied in conformance with the manufacturer's written recommendations. The patching material shall be compatible with the original epoxy coating material and shall be inert in concrete.

- All bars in any individual member shall be of the same grade, unless otherwise permitted by the Engineer.

- When bars are to be extended by the use of couplers, the assembled units shall have a tensile strength of not less than the manufacturer's minimum guaranteed ultimate tensile strength of the bars. Failure of any one sample to meet this requirement will be cause for rejection of the heat of bars and lot of couplers. The location of couplers in the member shall be subject to approval by the Engineer.

- Wires shall be straightened if necessary to produce equal stress in all wires or wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to ensure proper positioning in the ducts.

- Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires. The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire. No cold forming process shall be used that causes indentations in the wire. Buttonheads shall not contain wide open splits, more than 2 splits per head, or splits not parallel with the axis of the wire.

- Prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. The development of visible rust or other results of corrosion shall be cause for rejection, when ordered by the Engineer.

- Epoxy-coated prestressing steel strand shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the strand from exposure to sunlight, salt spray, and weather. For stacked coils, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the strand to prevent condensation under the covering. Epoxy-coated strand shall not be stored within 300 m of ocean or tidal water for more than 2 months.

- Prestressing steel shall be packaged in containers or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage. Except for epoxy-coated strand, a corrosion inhibitor which prevents rust or other results of corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.

- The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the type of corrosion inhibitor used, including the date packaged.

- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, and which is not epoxy-coated, shall be continuously protected against rust or other results of corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions specified herein.

- When steam curing is used, prestressing steel for post-tensioning shall not be installed until the steam curing is completed.

- Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.01-kg/L. Compressed air used to blow out ducts shall be oil free.

- When prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 days after the installation of the prestressing steel, rust which may form during those 10 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned, and grouted in this manner, all within 10 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 10 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust. The requirements in this section pertaining to tensioning and grouting within 10 days shall not apply to epoxy-coated prestressing steel strand.

- Any time prestressing steel for pretensioning is placed in the stressing bed and is exposed to the elements for more than 36 hours prior to encasement in concrete, adequate measures shall be taken by the Contractor, as approved by the Engineer, to protect the steel from contamination or corrosion.

- After final fabrication of the seven-wire prestressing steel strand, no electric welding of any form shall be performed on the prestressing steel. Whenever electric welding is performed on or near members containing prestressing steel, the welding ground shall be attached directly to the steel being welded.

- Pretensioned prestressing steel shall be cut off flush with the end of the member. For epoxy-coated prestressing steel, only abrasive saws shall be used to cut the steel. The exposed ends of the prestressing steel and a 25-mm strip of adjoining concrete shall be cleaned and painted. Cleaning shall be by wire brushing or abrasive blast cleaning to remove all dirt and residue on the metal or concrete surfaces. Immediately after cleaning, the surfaces shall be covered with one application of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," except that 2 applications shall be applied to surfaces which will not be covered by concrete or mortar. Aerosol cans shall not be used. The paint shall be thoroughly mixed at the time of application and shall be worked into any voids in the prestressing tendons.

The 2nd paragraph in Section 50-1.07, "Ducts," of the Standard Specifications is amended to read:

- 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.

The seventh paragraph in Section 50-1.07, "Ducts," of the Standard Specifications is amended to read:

- All ducts with a total length of 120 m or more shall be vented. Vents shall be placed at intervals of not more than 120 m and shall be located within 2 m of every high point in the duct profile. Vents shall be 12 mm 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 25 mm below the roadway surface after grouting has been completed.

The sixth paragraph of Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

- The following formula and friction coefficients shall be used in calculating friction losses in tendons:

$$T_0 = T_x e^{(\mu\alpha + KL)}$$

Where:

T_0 = steel stress at jacking end

T_x = steel stress at any point x

e = base of Napierian logarithms

μ = friction curvature coefficient

α = total angular change of prestressing steel profile in radians from jacking end to point x

K = friction wobble coefficient (=0.00066/m)

L = length of prestressing steel from jacking end to point x

Type of Steel Tendon	Length of Tendon L(m)	Type of Duct	M
Wire or Strand	0 to less than 183	Rigid or semi-rigid galvanized sheet metal	0.15
	183 to less than 275		0.20
	275 to less than 366		0.25
	Greater than or equal to 366		0.25*
Wire or Strand	All	Plastic	0.23
	All	Rigid Steel Pipes	0.25*
High Strength Bar	All	Rigid or semi-rigid galvanized sheet metal	0.30

* With the use of lubrication

The thirteenth and fourteenth paragraphs in Section 50-1.08, "Prestressing," of the Standard Specifications are amended to read:

- Prestressing steel in pretensioned members shall not be cut or released until the concrete in the member has attained a compressive strength of not less than the value shown on the plans or 28 MPa, whichever is greater. In addition to these concrete strength requirements, when epoxy-coated prestressing steel strand is used, the steel shall not be cut or released until the temperature of the concrete surrounding the strand is less than 65°C, and falling.

- When ordered by the Engineer, prestressing steel strands in pretensioned members, if tensioned individually, shall be checked by the Contractor for loss of prestress not more than 48 hours prior to placing concrete for the members. The method and equipment for checking the loss of prestress shall be subject to approval by the Engineer. Strands which show a loss of prestress in excess of 3 percent shall be retensioned to the original computed jacking stress.

Item 2 of the eleventh paragraph in Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

2. When the concrete is designated by class or cementitious material content, either the concrete compressive strength shall have reached the strength shown on the plans at the time of stressing or at least 28 days shall have elapsed since the last concrete to be prestressed has been placed, whichever occurs first.

The second and third paragraphs in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications are amended to read:

- 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."

The fifth paragraph in Section 50-1.10, "Samples for Testing," of the Standard Specifications is amended to read:

- The following samples of materials and tendons, selected by the Engineer from the prestressing steel at the plant or jobsite, shall be furnished by the Contractor to the Engineer well in advance of anticipated use:
 - A. For wire or bars, one 2-m long sample and for strand, one 1.5-m long sample, of each size shall be furnished for each heat or reel.
 - B. For epoxy-coated strand, one 1.5-m long sample of uncoated strand of each size shall be furnished for each reel.
 - C. If the prestressing tendon is a bar, one 2-m long sample shall be furnished and in addition, if couplers are to be used with the bar, two 1.25-m long samples of bar, equipped with one coupler and fabricated to fit the coupler, shall be furnished.

The first paragraph in Section 50-1.11, "Payment," of the Standard Specifications is amended to read:

- 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."

The second paragraph in Section 50-1.11, "Payment," of the Standard Specifications is amended to read:

- The contract lump sum prices paid for prestressing cast-in-place concrete of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing, placing, and tensioning the prestressing steel in cast-in-place concrete structures, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

SECTION 51: CONCRETE STRUCTURES

Issue Date: October 5, 2007

The eleventh paragraph in Section 51-1.05, "Forms," of the Standard Specifications is amended to read:

- Form panels for exposed surfaces shall be furnished and placed in uniform widths of not less than 0.9-m and in uniform lengths of not less than 1.8 m, except at the end of continuously formed surfaces where the final panel length required is less than 1.8 m. Where the width of the member formed is less than 0.9-m, the width of the panels shall be not less than the width of the member. Panels shall be arranged in symmetrical patterns conforming to the general lines of the structure. Except when otherwise provided herein or shown on the plans, panels for vertical surfaces shall be placed with the long dimension horizontal and with horizontal joints level and continuous. Form panels for curved surfaces of columns shall be continuous for a minimum of one quarter of the circumference, or 1.8 m. For walls with sloping footings which do not abut other walls, panels may be placed with the long dimension parallel to the footing. Form panels on each side of the panel joint shall be precisely aligned, by means of supports or fasteners common to both panels, to result in a continuous unbroken concrete plane surface. When prefabricated soffit panels are used, form filler panels joining prefabricated panels shall have a uniform minimum width of 0.3-m and shall produce a smooth uniform surface with consistent longitudinal joint lines between the prefabricated panels.

The first and second paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications are amended to read:

- The Contractor shall submit to the Engineer working drawings and design calculations for falsework proposed for use at bridges. For bridges where the height of any portion of the falsework, as measured from the ground line to the soffit of the superstructure, exceeds 4.25 m; or where any individual falsework clear span length exceeds 4.85 m; or where provision for vehicular, pedestrian, or railroad traffic through the falsework is made; the drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Six sets of the working drawings and 2 copies of the design calculations shall be furnished. Additional working drawings and design calculations shall be submitted to the Engineer when specified in "Railroad Relations and Insurance" of the special provisions.

- The falsework drawings shall include details of the falsework erection and removal operations showing the methods and sequences of erection and removal and the equipment to be used. The details of the falsework erection and removal operations shall demonstrate the stability of all or any portions of the falsework during all stages of the erection and removal operations.

The seventh paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended to read:

- In the event that several falsework plans are submitted simultaneously, or an additional plan is submitted for review before the review of a previously submitted plan has been completed, the Contractor shall designate the sequence in which the plans are to be reviewed. In such event, the time to be provided for the review of any plan in the sequence shall be not less than the review time specified above for that plan, plus 2 weeks for each plan of higher priority which is still under review. A falsework plan submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate falsework plan submittal.

Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended by adding the following paragraphs:

- If structural composite lumber is proposed for use, the falsework drawings shall clearly identify the structural composite lumber members by grade (E value), species, and type. The Contractor shall provide technical data from the manufacturer showing the tabulated working stress values of the composite lumber. The Contractor shall furnish a certificate of compliance as specified in Section 6-1.07, "Certificates of Compliance," for each delivery of structural composite lumber to the project site.

- For falsework piles with a calculated loading capacity greater than 900 kN, the falsework piles shall be designed by an engineer who is registered as either a Civil Engineer or a Geotechnical Engineer in the State of California, and the calculations shall be submitted to the Engineer.

The first paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than 4800 N/m² for the combined live and dead load regardless of slab thickness.

The eighth paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- In addition to the minimum requirements specified in this Section 51-1.06A, falsework for box girder structures with internal falsework bracing systems using flexible members capable of withstanding tensile forces only, shall be designed to include the vertical effects caused by the elongation of the flexible member and the design horizontal load combined with the dead and live loads imposed by concrete placement for the girder stems and connected bottom slabs. Falsework comprised of individual steel towers with bracing systems using flexible members capable of withstanding tensile forces only to resist overturning, shall be exempt from these additional requirements.

The third paragraph in Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended to read:

- When falsework is supported on piles, the piles shall be driven and the actual nominal resistance assessed in conformance with the provisions in Section 49, "Piling."

Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended by adding the following paragraphs:

- For falsework piles with a calculated nominal resistance greater than 1800 kN, the Contractor shall conduct dynamic monitoring of pile driving and generate field acceptance criteria based on a wave equation analysis. These analyses shall be signed by an engineer who is registered as a Civil Engineer in the State of California and submitted to the Engineer prior to completion of falsework erection.

- Prior to the placement of falsework members above the stringers, the final bracing system for the falsework shall be installed.

Section 51-1.06C, "Removing Falsework," of the Standard Specifications is amended by adding the following paragraph:

- The falsework removal operation shall be conducted in such a manner that any portion of the falsework not yet removed remains in a stable condition at all times.

The sixth paragraph in Section 51-1.09, "Placing Concrete," of the Standard Specifications is amended to read:

- Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement or epoxy-coated prestressing steel shall have a resilient covering to prevent damage to the epoxy-coating on the reinforcement or prestressing steel.

The fourth paragraph in Section 51-1.12D, "Sheet Packing, Preformed Pads, and Board Fillers," of the Standard Specifications is amended to read:

- Expanded polystyrene shall be a commercially available polystyrene board. Expanded polystyrene shall have a minimum flexural strength of 240 kPa determined in conformance with the requirements in ASTM Designation: C 203 and a compressive yield strength of between 110 and 275 kPa at 5 percent compression. Surfaces of expanded polystyrene against which concrete is placed shall be faced with hardboard. Hardboard shall be 3 mm 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.

Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended by adding the following paragraph:

- The opening of the joints at the time of placing shall be that shown on the plans adjusted for temperature. Care shall be taken to avoid impairment of the clearance in any manner.

The first paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- Where shown on the plans, joints in structures shall be sealed with joint seals, joint seal assemblies, or seismic joints in conformance with the details shown on the plans, the provisions in these specifications, and the special provisions.

The 2nd paragraph of Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- Type A and AL joint seals shall consist of a groove in the concrete that is filled with field-mixed silicone sealant.

The fourth paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- Joint seal assemblies and seismic joints shall consist of metal or metal and elastomeric assemblies which are anchored or cast into a recess in the concrete over the joint. Strip seal joint seal assemblies consist of only one joint cell. Modular unit joint seal assemblies consist of more than one joint cell.

The fifth paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- The Movement Rating (MR) shall be measured normal to the longitudinal axis of the joint. The type of seal to be used for the MR shown on the plans shall be as follows:

Movement Rating (MR)	Seal Type
MR ≤ 25 mm	Type A or Type B
25 mm < MR ≤ 50 mm	Type B
50 mm < MR ≤ 100 mm	Joint Seal Assembly (Strip Seal)
MR > 100 mm	Joint Seal Assembly (Modular Unit) or Seismic Joint

The 1st paragraph of Section 51-1.12F(3)(a), "Type A and AL Seal," of the Standard Specifications is amended to read:

- The sealant must consist of a 2-component silicone sealant that will withstand up to ±50 percent movement.

The 2nd paragraph of Section 51-1.12F(3)(a), "Type A and AL Seal," of the Standard Specifications is amended to read:

- Silicone sealants must be tested under California Test 435 and must comply with the following:

Specification	Requirement
Modulus at 150 percent elongation	35–520 kPa
Recovery	17 mm max.
Notch Test	Notched or loss of bond 6 mm, max.
Water Resistance	Notched or loss of bond 6 mm, 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

The 3rd paragraph of Section 51-1.12F(3)(a), "Type A and AL Seal," of the Standard Specifications is deleted.

The 8th paragraph of Section 51-1.12F(3)(a), "Type A and AL Seal," of the Standard Specifications is deleted.

The 10th paragraph of Section 51-1.12F(3)(a), "Type A and AL Seal," of the Standard Specifications is amended to read:

- 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."

The 2nd paragraph of Section 51-1.12F(3)(b), "Type B Seal," of the Standard Specifications is amended to read:

- 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 18 m 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 80 mm with commercial quality open cell polyurethane foam or closed by other means subject to approval by the Engineer.

The 7th paragraph of Section 51-1.12F(3)(b), "Type B Seal," of the Standard Specifications is amended to read:

- 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.

Section 51-1.12F(3)(c), "Joint Seal Assemblies," of the Standard Specifications is amended to read:

(c) Joint Seal Assemblies and Seismic Joints

- Joint seal assemblies and seismic joints shall be furnished and installed in joints in bridge decks as shown on the plans and as specified in the special provisions.

The eighth paragraph in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

- The elastomer, as determined from test specimens, shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	15.5 Min.
Elongation at break, percent	D 412	350 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	25 Max.
Tear strength, kN/m	D 624 (Die C)	31.5 Min.
Hardness (Type A)	D 2240 with 2 kg. mass	55 ±5
Ozone resistance 20% strain, 100 h at 40°C ±2°C	D 1149 (except 100 ±20 parts per 100 000 000)	No cracks
Instantaneous thermal stiffening at -40°C	D 1043	Shall not exceed 4 times the stiffness measured at 23°C
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass

The table in the ninth paragraph of Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

Tensile strength, percent	-15
Elongation at break, percent	-40; but not less than 300% total elongation of the material
Hardness, points	+10

The first paragraph in Section 51-1.12H(2), "Steel Reinforced Elastomeric Bearings," of the Standard Specifications is amended to read:

- Steel reinforced elastomeric bearings shall conform to the requirements for steel-laminated elastomeric bearings in ASTM Designation: D 4014 and the following:

- A. 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 1.9 mm (14 gage). Internal elastomer laminates shall have a thickness of 12 mm, and top and bottom elastomer covers shall each have a thickness of 6 mm. The combined thickness of internal elastomer laminates and top and bottom elastomer covers shall be equal to the bearing pad thickness shown on the plans. The elastomer cover to the steel laminates at the sides of the bearing shall be 3 mm. If guide pins or other devices are used to control the side cover over the steel laminates, any exposed portions of the steel laminates shall be sealed by vulcanized patching. The length, width, or diameter of the bearings shall be as shown on the plans.
- B. The total thickness of the bearings shall be equal to the thickness of elastomer laminates and covers plus the thickness of the steel laminates.

- C. Elastomer for steel reinforced elastomeric bearings shall conform to the provisions for elastomer in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads."
- D. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer certifying that the bearings to be furnished conform to all of the above provisions. The Certificate of Compliance shall be supported by a certified copy of the results of tests performed by the manufacturer on the bearings.
- E. One sample bearing shall be furnished to the Engineer from each lot of bearings to be furnished for the contract. Samples shall be available at least 3 weeks in advance of intended use. The sample bearing shall be one of the following:

Bearing Pad Thickness as Shown on the Plans	Sample Bearing
≤ 50 mm	Smallest complete bearing shown on the plans
> 50 mm	* 57 ± 3 mm thick sample not less than 200 mm x 305 mm in plan and cut by the manufacturer from the center of one of the thickest complete bearings

* The sample bearing plus remnant parts of the complete bearing shall be furnished to the Engineer.

- F. A test specimen taken from the sample furnished to the Engineer will be tested in conformance with the requirements in California Test 663. Specimens tested shall show no indication of loss of bond between the elastomer and steel laminates.

The first paragraph in Section 51-1.135, "Mortar," of the Standard Specifications is amended to read:

- Mortar shall be composed of cementitious material, sand, and water proportioned and mixed as specified in this Section 51-1.135.

The third paragraph in Section 51-1.135, "Mortar," of the Standard Specifications is amended to read:

- The proportion of cementitious material to sand, measured by volume, shall be 1:2 unless otherwise specified.

The fourth paragraph in Section 51-1.14, "Waterstops," of the Standard Specifications is amended to read:

- Neoprene shall be manufactured from a vulcanized elastomeric compound containing neoprene as the sole elastomer and shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	13.8 Min.
Elongation at break, percent	D 412	300 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	30 Max.
Tear strength, kN/m	D 624 (Die C)	26.3 Min.
Hardness (Type A)	D 2240	55±5
Ozone resistance 20% strain, 100 h at 38°C ±1°C	D 1149 (except 100±20 parts per 100 000 000)	No cracks
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass
Flame resistance	C 542	Must not propagate flame
Oil Swell, ASTM Oil #3, 70 h at 100°C, volume change, percent	D 471	80 Max.
Water absorption, immersed 7 days at 70°C, change in mass, percent	D 471	15 Max.

The first sentence of the fourth paragraph in Section 51-1.17, "Finish Bridge Decks," of the Standard Specifications is amended to read:

- The smoothness of completed roadway surfaces of structures, approach slabs and the adjacent 15 m of approach pavement, and the top surfaces of concrete decks which are to be covered with another material, will be tested by the Engineer with a bridge profilograph in conformance with the requirements in California Test 547 and the requirements herein.

Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications is amended by deleting the seventh, thirteenth and fourteenth paragraphs and adding the following subsection:

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 50 square meter portion of deck within the limits of the new concrete deck, should the intensity of cracking be such that there are more than 5 m of cracks whose width at any location exceeds 0.5 mm, the deck shall be treated with methacrylate resin. 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 1.5 m beyond the furthest single continuous crack outside the 50 square meter portion, measured from where that crack exceeds 0.5 mm in width, as determined by the Engineer.
- Deck crack treatment shall include furnishing, testing, and application of methacrylate resin and sand. If grinding is required, deck treatment shall take place before grinding.

51-1.17A(1) Submittals

- Before starting deck treatment, the Contractor shall submit plans in conformance with Section 5-1.02, "Plans and Working Drawings," for the following:
 1. Public safety plan for the use of methacrylate resin
 2. Placement plan for the construction operation
- The plans shall identify materials, equipment, and methods to be used.
- The public safety plan for the use of methacrylate resin shall include details for the following:
 1. Shipping
 2. Storage
 3. Handling
 4. Disposal of residual methacrylate resin and the containers
- The placement plan for construction shall include the following:
 1. Schedule of deck treatment for each bridge. The schedule shall be consistent with "Maintaining Traffic," of the special provisions and shall include time for the Engineer to perform California Test 342.
 2. Methods and materials to be used, including the following:
 - 2.1. Description of equipment for applying the resin
 - 2.2. Description of equipment for applying the sand
 - 2.3. Gel time range and final cure time for the resin
- If the measures proposed in the safety plan are inadequate to provide for public safety associated with the use of methacrylate 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.
- In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

51-1.17A(2) Materials

- Before using methacrylate resin, a Material Safety Data Sheet shall be submitted for each shipment of resin.
- Methacrylate resin shall be low odor and have a high molecular weight. Before adding initiator, the resin shall have a maximum volatile content of 30 percent when tested in conformance with the requirements in ASTM Designation: D 2369, and shall conform to the following:

PROPERTY	REQUIREMENT	TEST METHOD
* Viscosity	0.025 Pa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C	ASTM D 2196
* Specific Gravity	0.90 minimum, at 25°C	ASTM D 1475
* Flash Point	82°C, minimum	ASTM D 3278
* Vapor Pressure	1.0 mm Hg, maximum, at 25°C	ASTM D 323
Tack-free Time	400 minutes, maximum, at 25°C	Specimen 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 shall be performed before adding initiator.		

51-1.17A(3) Testing

- The Contractor shall allow 20 days for sampling and testing by the Engineer of the methacrylate resin before proposed use. If bulk resin is to be used, the Contractor shall notify the Engineer in writing at least 15 days before the delivery of the bulk resin to the job site. Bulk resin is any resin stored in containers in excess of 209 liters.
- Before starting production treatment, the Contractor shall treat a test area of approximately 50 square meters that is within the project limits and at a location approved by the Engineer. When available the test area shall be outside of the traveled way. Weather and pavement conditions during the test treatment shall be similar to those expected on the deck. Equipment used for testing shall be similar to those used for deck treating operations.
- During test and production deck treatment, test tiles shall be used to evaluate the resin cure time. The Contractor shall coat at least one 102 mm x 102 mm commercial quality smooth glazed tile for each batch of methacrylate resin. The coated tile shall be placed adjacent to the corresponding treated area. Sand shall not be applied to the test tiles.
- The acceptance criteria for a treated area is as follows:
 1. The test tiles are dry to the touch.
 2. The treated deck surface is tack free (non-oily).
 3. The sand cover adheres and resists brushing by hand.
 4. Excess sand has been removed by vacuuming or sweeping.
 5. The coefficient of friction is at least 0.35 when tested in conformance with California Test 342.
- If a test or production area fails to meet the acceptance criteria, as determined by the Engineer, the treatment will be rejected, and the treatment shall be removed and replaced until the area complies with the acceptance criteria.

51-1.17A(4) Construction

- Equipment shall be fitted with suitable traps, filters, drip pans, or other devices as necessary to prevent oil or other deleterious material from being deposited on the deck.
- Before deck treatment with methacrylate resin, the bridge deck surface shall be cleaned by abrasive blasting, and all loose material shall be blown from visible cracks using high-pressure air. Concrete curing seals shall be cleaned from the deck surface to be treated, and the deck shall be dry when blast cleaning is performed. If the deck surface becomes contaminated at any time before placing the resin, the deck surface shall be cleaned by abrasive blasting.

- Where abrasive blasting is being performed within 3 m of a lane occupied by public traffic, the residue including dust shall be removed immediately after contact between the abrasive and the surface being treated. The removal shall be by a vacuum attachment operating concurrently with the abrasive blasting operation.
- A compatible promoter/initiator system shall be capable of providing the resin gel time range shown on the placement plan. Gel time shall be adjusted to compensate for the changes in temperature throughout treatment application.
- Resin shall be applied by machine and by using a two-part resin system with a promoted resin for one part and an initiated resin for the other part. This two-part resin system shall be combined at equal volumes to the spray bars through separate positive displacement pumps. Combining of the 2 components shall be by either static in-line mixers or by external intersecting spray fans. The pump pressure at the spray bars shall not be great enough to cause appreciable atomization of the resin. Compressed air shall not be used to produce the spray. A shroud shall be used to enclose the spray bar apparatus.
- At the Contractor's option, manual application may be used. For manual application, (1) the quantity of resin mixed with promoter and initiator shall be limited to 20 L at a time, and (2) the resin shall be distributed by squeegees and brooms within 10 minutes after application.
- The Contractor shall apply methacrylate resin only to the specified area. Barriers, railing, joints, and drainage facilities shall be adequately protected to prevent contamination by the treatment material. Contaminated items shall be repaired at the Contractor's expense.
- The relative humidity shall be less than 90 percent at the time of treatment. The prepared area shall be dry and the surface temperature shall be at least 10°C , and not more than 38°C when the resin is applied. The rate of application of promoted/initiated resin shall be 2.2 square meter per liter; the exact rate shall be determined by the Engineer.
- The deck surfaces to be treated shall be completely covered with resin so the resin penetrates and fills all cracks. The resin shall be applied within 5 minutes after complete mixing. A significant increase in viscosity shall be cause for rejection. Excess material shall be redistributed by squeegees or brooms within 10 minutes after application. For textured deck surfaces, including grooved surfaces, excess material shall be removed from the texture indentations.
- After the resin has been applied, at least 20 minutes shall elapse before applying sand. The sand shall be commercial quality dry blast sand. At least 95 percent of the sand shall pass the 2.36-mm sieve and at least 95 percent shall be retained on the 850-µm sieve. The sand shall be applied at a rate of approximately one kilogram per square meter or until refusal as determined by the Engineer.
- Traffic will not be allowed on treated areas until the acceptance criteria has been met as determined by the Engineer.

The second paragraph in Section 51-1.18C, "Class 2 Surface Finish (Gun Finish)," of the Standard Specifications is amended to read:

- 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 6 mm 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.

The fifth paragraph in Section 51-1.18C, "Class 2 Surface Finish (Gun Finish)," of the Standard Specifications is amended to read:

- 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.

The fourteenth paragraph in Section 51-1.23, "Payment," of the Standard Specifications is amended by deleting "and injecting epoxy in cracks".

Section 51-1.23, "Payment," of the Standard Specifications is amended by adding the following:

- Full compensation for deck crack treatment, including execution of 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

Issue Date: December 7, 2007

The first paragraph in Section 52-1.02A, "Bar Reinforcement," of the Standard Specifications is amended to read:

• Reinforcing bars shall be low-alloy steel deformed bars conforming to the requirements in ASTM Designation: A 706/A 706M, except that deformed or plain billet-steel bars conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, may be used as reinforcement in the following 5 categories:

- A. Slope and channel paving,
- B. Minor structures,
- C. Sign and signal foundations (pile and spread footing types),
- D. Roadside rest facilities, and
- E. Concrete barrier Type 50 and Type 60 series and temporary railing.

The third paragraph in Section 52-1.04, "Inspection," of the Standard Specifications is amended to read:

• A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall also be furnished for each shipment of epoxy-coated bar reinforcement or wire reinforcement certifying that the coated reinforcement conforms to the requirements in ASTM Designation: A 775/A 775M or A 884/A 884M respectively, and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement." The Certificate of Compliance shall include all of the certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M respectively.

The third paragraph of Section 52-1.06, "Bending," of the Standard Specifications is amended to read:

• Hooks and bends shall conform to the provisions of the Building Code Requirements for Structural Concrete of the American Concrete Institute.

Section 52-1.07 "Placing," of the Standard Specifications is amended by deleting item C of the third paragraph.

The eleventh paragraph in Section 52-1.07, "Placing," of the Standard Specifications is amended to read:

• Attention is directed to the provisions in Section 7-1.09, "Public Safety." Whenever a portion of an assemblage of bar reinforcing steel that is not encased in concrete exceeds 6 m in height, the Contractor shall submit to the Engineer for approval, in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings and design calculations for the temporary support system to be used. The working drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. The temporary support system shall be designed to resist all expected loads and shall be adequate to prevent collapse or overturning of the assemblage. If the installation of forms or other work requires revisions to or temporary release of any portion of the temporary support system, the working drawings shall show the support system to be used during each phase of construction. The minimum horizontal wind load to be applied to the bar reinforcing steel assemblage, or to a combined assemblage of reinforcing steel and forms, shall be the sum of the products of the wind impact area and the applicable wind pressure value for each height zone. The wind impact area is the total projected area of the cage normal to the direction of the applied wind. Wind pressure values shall be determined from the following table:

Height Zone (Meters above ground)	Wind Pressure Value (Pa)
0-9.0	960
9.1-15.0	1200
15.1-30.0	1440
Over 30	1675

Section 52-1.08 "Splicing," of the Standard Specifications is amended to read:

52-1.08 SPLICING

• Splices of reinforcing bars shall consist of lap splices, service splices, or ultimate butt splices.

- Splicing of reinforcing bars will not be permitted at a location designated on the plans as a "No-Splice Zone." At the option of the Contractor, reinforcing bars may be continuous at locations where splices are shown on the plans. The location of splices, except where shown on the plans, shall be determined by the Contractor using available commercial lengths where practicable.

- Unless otherwise shown on the plans, splices in adjacent reinforcing bars at any particular section shall be staggered. The minimum distance between staggered lap splices or mechanical lap splices shall be the same as the length required for a lap splice in the largest bar. The minimum distance between staggered butt splices shall be 600 mm, measured between the midpoints of the splices along a line which is centered between the axes of the adjacent bars.

52-1.08A Lap Splicing Requirements

- Splices made by lapping shall consist of placing reinforcing bars in contact and wiring them together, maintaining the alignment of the bars and the minimum clearances. Should the Contractor elect to use a butt welded or mechanical splice at a location not designated on the plans as requiring a service or ultimate butt splice, this splice shall conform to the testing requirements for service splice.

- Reinforcing bars shall not be spliced by lapping at locations where the concrete section is not sufficient to provide a minimum clear distance of 50 mm between the splice and the nearest adjacent bar. The clearance to the surface of the concrete specified in Section 52-1.07, "Placing," shall not be reduced.

- Reinforcing bars Nos. 43 and 57 shall not be spliced by lapping.

- Where ASTM Designations: A 615/A 615M, Grade 420 or A 706/A 706M reinforcing bars are required, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 45 diameters of the smaller bar joined; and reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 60 diameters of the smaller bar joined, except when otherwise shown on the plans.

- Where ASTM Designation: A 615/A 615M, Grade 280 reinforcing bars are permitted, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 30 diameters of the smaller bar joined; and reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 45 diameters of the smaller bar joined, except when otherwise shown on the plans.

- Splices in bundled bars shall conform to the following:

A. In bundles of 2 bars, the length of the lap splice shall be the same as the length of a single bar lap splice.

B. In bundles of 3 bars, the length of the lap splice shall be 1.2 times the length of a single bar lap splice.

- Welded wire fabric shall be lapped such that the overlap between the outermost cross wires is not less than the larger of:

A. 150 mm,

B. The spacing of the cross wires plus 50 mm, or

C. The numerical value of the longitudinal wire size (MW-Size Number) times 370 divided by the spacing of the longitudinal wires in millimeters.

52-1.08B Service Splicing and Ultimate Butt Splicing Requirements

- Service splices and ultimate butt splices shall be either butt welded or mechanical splices, shall be used at the locations shown on the plans, and shall conform to the requirements of these specifications and the special provisions.

52-1.08B(1) Mechanical Splices

- Mechanical splices to be used in the work shall be on the Department's current prequalified list before use. The prequalified list can be obtained from the Department's internet site listed in the special provisions or by contacting the Transportation Laboratory directly.

- When tested in conformance with the requirements in California Test 670, the total slip shall not exceed the values listed in the following table:

Reinforcing Bar Number	Total Slip (µm)
13	250
16	250
19	250
22	350
25	350
29	350
32	450
36	450
43	600
57	750

- Slip requirements shall not apply to mechanical lap splices, splices that are welded, or splices that are used on hoops.
- Splicing procedures shall be in conformance with the manufacturer's recommendations, except as modified in this section. Splices shall be made using the manufacturer's standard equipment, jigs, clamps, and other required accessories.
- Splice devices shall have a clear coverage of not less than 40 mm measured from the surface of the concrete to the outside of the splice device. Stirrups, ties, and other reinforcement shall be adjusted or relocated, and additional reinforcement shall be placed, if necessary, to provide the specified clear coverage to reinforcement.
- The Contractor shall furnish the following information for each shipment of splice material in conformance with the provisions in Section 6-1.07, "Certificates of Compliance:"
 - A. The type or series identification of the splice material including tracking information for traceability.
 - B. The bar grade and size number to be spliced.
 - C. A copy of the manufacturer's product literature giving complete data on the splice material and installation procedures.
 - D. A statement that the splicing systems and materials used in conformance with the manufacturer's installation procedures will develop the required tensile strengths, based on the nominal bar area, and will conform to the total slip requirements and the other requirements in these specifications.
 - E. A statement that the splice material conforms to the type of mechanical splice in the Department's current prequalified list.

52-1.08B(2) Butt Welded Splices

- Except for resistance butt welds, butt welded splices of reinforcing bars shall be complete joint penetration butt welds conforming to the requirements in AWS D 1.4, and these specifications.
- Welders and welding procedures shall be qualified in conformance with the requirements in AWS D 1.4.
- Only the joint details and dimensions as shown in Figure 3.2, "Direct Butt Joints," of AWS D 1.4, shall be used for making complete joint penetration butt welds of bar reinforcement. Split pipe backing shall not be used.
- Butt welds shall be made with multiple weld passes using a stringer bead without an appreciable weaving motion. The maximum stringer bead width shall be 2.5 times the diameter of the electrode and slagging shall be performed between each weld pass. Weld reinforcement shall not exceed 4 mm in convexity.
- Electrodes used for welding shall meet the minimum Charpy V-notch impact requirement of 27°J at -20°C.
- For welding of bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or Grade 420, the requirements of Table 5.2, "Minimum Preheat and Interpass Temperatures," of AWS D 1.4 are superseded by the following:

The minimum preheat and interpass temperatures shall be 200°C for Grade 280 bars and 300°C for Grade 420 bars. Immediately after completing the welding, at least 150 mm 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 90°C.

- When welding different grades of reinforcing bars, the electrode shall conform to Grade 280 bar requirements and the preheat shall conform to the Grade 420 bar requirements.
- In the event that any of the specified preheat, interpass, and post weld cooling temperatures are not met, all weld and heat affected zone metal shall be removed and the splice rewelded.

- Welding shall be protected from air currents, drafts, and precipitation to prevent loss of heat or loss of arc shielding. The method of protecting the welding area from loss of heat or loss of arc shielding shall be subject to approval by the Engineer.

- Reinforcing bars shall not be direct butt spliced by thermite welding.
- Procedures to be used in making welded splices in reinforcing bars, and welders employed to make splices in reinforcing bars, shall be qualified by tests performed by the Contractor on sample splices of the type to be used, before making splices to be used in the work.

52-1.08B(3) Resistance Butt Welds

- Shop produced resistance butt welds shall be produced by a fabricator who is approved by the Transportation Laboratory. The list of approved fabricators can be obtained from the Department's internet site or by contacting the Transportation Laboratory directly.

- Before manufacturing hoops using resistance butt welding, the Contractor shall submit to the Engineer the manufacturer's Quality Control (QC) manual for the fabrication of hoops. As a minimum, the QC manual shall include the following:

- A. The pre-production procedures for the qualification of material and equipment.
- B. The methods and frequencies for performing QC procedures during production.
- C. The calibration procedures and calibration frequency for all equipment.
- D. The welding procedure specification (WPS) for resistance welding.
- E. The method for identifying and tracking lots.

52-1.08C Service Splice and Ultimate Butt Splice Testing Requirements

- The Contractor shall designate in writing a splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all service and ultimate butt splicing including the inspection of materials and workmanship performed by the Contractor and all subcontractors; and 2) submitting, receiving, and approving all correspondence, required submittals, and reports regarding service and ultimate splicing to and from the Engineer.

- 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.

- Testing on prequalification and production sample splices shall be performed at the Contractor's expense, at an independent qualified 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, and shall have the following:

- A. Proper facilities, including a calibrated tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
- B. A device for measuring the total slip of the reinforcing bars across the splice to the nearest 25 μm , that, when placed parallel to the longitudinal axis of the bar is able to simultaneously measure movement across the splice at 2 locations 180 degrees apart.
- C. Operators who have received formal training for performing the testing requirements of ASTM Designation: A 370 and California Test 670.
- D. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

- The Contractor shall provide samples for quality assurance testing in conformance with the provisions in these specifications and the special provisions.

- Prequalification and production sample splices and testing shall conform to California Test 670 and these specifications.

- The Contractor shall ensure that sample splices are properly secured and transported to the testing laboratory in such a manner that no alterations to the physical conditions occur during transportation. Sample splices shall be tested in the same condition as received. No modifications to the sample splices shall be made before testing.

- Each set or sample splice, as defined herein, shall be identified as representing either a prequalification or production test sample splice.

- For the purpose of production testing, a lot of either service splices or ultimate butt splices is defined as 1) 150, or fraction thereof, of the same type of mechanical splices used for each bar size and each bar deformation pattern that is used in the work, or 2) 150, or fraction thereof, of complete joint penetration butt welded splices or resistance butt welded splices for each bar size used in the work. If different diameters of hoop reinforcement are shown on the plans, separate lots shall be used for each different hoop diameter.

- Whenever a lot of splices is rejected, the rejected lot and subsequent lots of splices shall not be used in the work until 1) the QCM performs a complete review of the Contractor's quality control process for these splices, 2) a written report is submitted to the Engineer describing the cause of failure for the splices in this lot and provisions for preventing similar failures in future lots, and 3) the Engineer has provided the Contractor with written notification that the report is acceptable. The Engineer shall have 3 working days after receipt of the report to provide notification to the Contractor. In the event the Engineer fails to provide notification within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in providing notification, the Contractor will be compensated for any resulting loss, and an extension of time will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

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 splice material information, names of the operators who will be performing the splicing, and descriptions of the positions, locations, equipment, and procedures that will be used in the work.

- The Splice Prequalification Report shall also include certifications from the fabricator for prequalifications 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 independent qualified 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 the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

52-1.08C(2) Service Splice Test Criteria

- Service production and quality assurance sample splices shall be tensile tested in conformance with the requirements in ASTM Designation: A 370 and California Test 670 and shall develop a minimum tensile strength of not less than 550 MPa.

52-1.08C(2)(a) Production Test Requirements for Service Splices

- Production tests shall be performed by the Contractor's independent 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 when and the 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 independent 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. 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.

- Should only 2 sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," one additional production test shall be performed on the same lot of splices. This additional production test shall consist of testing 4 sample splices that have been randomly selected by the Engineer and removed by the Contractor from the actual completed lot of splices. Should any of the 4 splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

- If only one sample splice from a production test conforms 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 rejected.

- If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed before the Engineer selects additional splices from this lot for further testing.

52-1.08C(2)(b) Quality Assurance Test Requirements for Service Splices

- For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional service quality assurance sample splices. These service quality assurance sample splices shall be prepared in the same manner as specified herein for service production sample splices.

- These 4 additional quality assurance sample splices shall be shipped to the Transportation Laboratory for quality assurance testing. The 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), for mechanical splices, or in Section 52-1.08B(3), 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."

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.

- A minimum of 1 control bar shall be removed from the same bar as, and adjacent to, all ultimate prequalification, production, and quality assurance sample splices. The lengths of control bars shall conform to the lengths specified for sample splices in California Test 670. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.

- Each sample splice and its associated control bar shall be identified and marked as a set. Each set 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 and control bar, 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 in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample splice has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample splice. In addition, necking of the bar, as defined in California Test 670, shall occur at rupture regardless of whether the bar breaks inside or outside the affected zone.

- 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 ultimate tensile strength shall be determined for all control bars by tensile testing the bars to rupture, regardless of where each sample splice ruptures. If 2 control bars are tested for one sample splice, the bar with the lower ultimate tensile strength shall be considered the control bar.

52-1.08C(3)(a) Production Test Requirements for Ultimate Butt Splices

- Production tests shall be performed for all ultimate butt splices used in the work. A production test shall consist of testing 4 sets of sample splices and control bars removed from each lot of completed splices, except when quality assurance tests are performed.

- After the splices in a lot have been completed, and the bars have been epoxy-coated when required, the QCM shall notify the Engineer in writing that the splices in this lot conform to the specifications and are ready for testing. Except for hoops, sample splices will be selected by the Engineer at the job site. Sample splices for hoops will be selected by the Engineer either at the job site or a fabrication facility.

- 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. The Contractor shall select the adjacent control bar for each sample splice bar, and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory.
- At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.
- A sample splice or control bar from any set will be rejected if a tamper-proof marking or seal is disturbed before testing.
- The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sets of 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. 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.
- If 3 or more sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.
- Should only 2 sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," one additional production test shall be performed on the same lot of splices. Should any of the 4 sample splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.
- If only one sample splice from a production test conforms to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be rejected.
- If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects additional splices from this lot for further testing.
- Production tests will not be required on repaired splices from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair. However, should an additional production test be required, the Engineer may select any repaired splice for the additional production test.

52-1.08C(3)(b) Quality Assurance Test Requirements for Ultimate Butt Splices

- For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional ultimate quality assurance sample splices along with associated control bars.
- Each time 4 additional ultimate quality assurance sample splices are prepared, 2 of these quality assurance sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets, together, shall conform to the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."
- The 2 remaining quality assurance sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 sets 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."

52-1.08C(3)(c) Nondestructive Splice Tests

- When the specifications allow for welded sample splices to be taken from other than the completed lot of splices, the Contractor shall meet the following additional requirements.
- Except for resistance butt welded splices, radiographic examinations shall be performed on 25 percent of all complete joint penetration butt welded splices from a production lot. The size of a production lot will be a maximum of 150 splices. The Engineer will select the splices which will compose the production lot and also the splices within each production lot to be radiographically examined.
- All required radiographic examinations of complete joint penetration butt welded splices shall be performed by the Contractor in conformance with the requirements in AWS D 1.4 and these specifications.
- Before radiographic examination, welds shall conform to the requirements in Section 4.4, "Quality of Welds," of AWS D 1.4.

- Should more than 12 percent of the splices which have been radiographically examined in any production lot be defective, an additional 25 percent of the splices, selected by the Engineer from the same production lot, shall be radiographically examined. Should more than 12 percent of the cumulative total of splices tested from the same production lot be defective, all remaining splices in the lot shall be radiographically examined.
- Additional radiographic examinations performed due to the identification of defective splices shall be at the Contractor's expense.
 - All defects shall be repaired in conformance with the requirements in AWS D 1.4.
 - The Contractor shall notify the Engineer in writing 48 hours before performing any radiographic examinations.
 - The radiographic procedure used shall conform to the requirements in AWS D1.1, AWS D1.4, and the following:
 - A. Two exposures shall be made for each complete joint penetration butt welded splice. For each of the 2 exposures, the radiation source shall be centered on each bar to be radiographed. The first exposure shall be made with the radiation source placed at zero degrees from the top of the weld and perpendicular to the weld root and identified with a station mark of "0." The second exposure shall be at 90 degrees to the "0" station mark and shall be identified with a station mark of "90." When obstructions prevent a 90 degree placement of the radiation source for the second exposure, and when approved in writing by the Engineer, the source may be rotated, around the centerline of the reinforcing bar, a maximum of 25 degrees.
 - B. For field produced complete joint penetration butt welds, no more than one weld shall be radiographed during one exposure. For shop produced complete joint penetration butt welds, if more than one weld is to be radiographed during one exposure, the angle between the root line of each weld and the direction to the radiation source shall be not less than 65 degrees.
 - C. Radiographs shall be made by either X-ray or gamma ray. Radiographs made by X-ray or gamma rays shall have densities of not less than 2.3 nor more than 3.5 in the area of interest. A tolerance of 0.05 in density is allowed for densitometer variations. Gamma rays shall be from the iridium 192 isotope and the emitting specimen shall not exceed 4.45 mm in the greatest diagonal dimension.
 - D. The radiographic film shall be placed perpendicular to the radiation source at all times; parallel to the root line of the weld unless source placement determines that the film must be turned; and as close to the root of the weld as possible.
 - E. The minimum source to film distance shall be maintained so as to ensure that all radiographs maintain a maximum geometric unsharpness of 0.020 at all times, regardless of the size of the reinforcing bars.
 - F. Penetrators shall be placed on the source side of the bar and perpendicular to the radiation source at all times. One penetrator shall be placed in the center of each bar to be radiographed, perpendicular to the weld root, and adjacent to the weld. Penetrator images shall not appear in the weld area.
 - G. When radiography of more than one weld is being performed per exposure, each exposure shall have a minimum of one penetrator per bar, or 3 penetrators per exposure. When 3 penetrators per exposure are used, one penetrator shall be placed on each of the 2 outermost bars of the exposure, and the remaining penetrator shall be placed on a centrally located bar.
 - H. An allowable weld buildup of 4 mm may be added to the total material thickness when determining the proper penetrator selection. No image quality indicator equivalency will be accepted. Wire penetrators or penetrator blocks shall not be used.
 - I. Penetrators shall be sufficiently shimmed using a radiographically identical material. Penetrator image densities shall be a minimum of 2.0 and a maximum of 3.6.
 - J. Radiographic film shall be Class 1, regardless of the size of reinforcing bars.
 - K. Radiographs shall be free of film artifacts and processing defects, including, but not limited to, streaks, scratches, pressure marks or marks made for the purpose of identifying film or welding indications.
 - L. Each splice shall be clearly identified on each radiograph and the radiograph identification and marking system shall be established between the Contractor and the Engineer before radiographic inspection begins. Film shall be identified by lead numbers only; etching, flashing or writing in identifications of any type will not be permitted. Each piece of film identification information shall be legible and shall include, as a minimum, the following information: Contractor's name, date, name of nondestructive testing firm, initials of radiographer, contract number, part number and weld number. The letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld.
 - M. Radiographic film shall be developed within a time range of one minute less to one minute more than the film manufacturer's recommended maximum development time. Sight development will not be allowed.
 - N. Processing chemistry shall be done with a consistent mixture and quality, and processing rinses and tanks shall be clean to ensure proper results. Records of all developing processes and any chemical changes to the developing processes shall be kept and furnished to the Engineer upon request. The Engineer may request, at any time, that a sheet of unexposed film be processed in the presence of the Engineer to verify processing chemical and rinse quality.

- O. The results of all radiographic interpretations shall be recorded on a signed certification and a copy kept with the film packet.
- P. Technique sheets prepared in conformance with the requirements in ASME Boiler and Pressure Vessels Code, Section V, Article 2 Section T-291 shall also contain the developer temperature, developing time, fixing duration and all rinse times.

52-1.08D Reporting Test Results

- A Production Test Report for all testing performed on each lot shall be prepared by the 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 and any associated control bar, any notable defects, total measured slip, ultimate tensile strength of each splice, and for ultimate butt splices, limits of affected zone, location of visible necking area, ultimate tensile strength and 95 percent of this ultimate tensile strength for each control bar, and a comparison between 95 percent of the ultimate tensile strength of each control bar and the ultimate tensile strength of its associated splice.

- 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. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review and provide notification within the time allowed, and if, in the opinion of the Engineer, the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

- Quality assurance test results for each bundle of 4 sets or 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. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

Section 52-1.11, "Payment," of the Standard Specifications is amended by adding the following paragraph after the seventh paragraph:

- If a portion or all of the reinforcing steel is epoxy-coated more than 480 air line kilometers 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 these expenses, it is agreed that payment to the Contractor for furnishing the epoxy-coated reinforcement will be reduced \$5000 for each epoxy-coating facility located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional \$3000 (\$8000 total) for each epoxy-coating facility located more than 4800 air line kilometers from both Sacramento and Los Angeles.

SECTION 53: SHOTCRETE

Issue Date: November 2, 2007

The third paragraph in Section 53-1.01, "Description," of the Standard Specifications is amended to read:

- 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.

The first through fourth paragraphs in Section 53-1.02, "Materials," of the Standard Specifications is amended to read:

- 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 mass. The fine aggregate shall contain not more than 6 percent moisture by mass.
- 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 375 kilograms of cementitious material per cubic meter. 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 12.5 mm screen and at least 90 percent passes the 9.5 mm screen.
- Admixtures may be added to shotcrete and shall conform to the provisions in Section 90-4, "Admixtures."

The third subparagraph of the third paragraph in Section 53-1.04, "Placing Shotcrete," of the Standard Specifications is amended to read:

Aggregate and cementitious material that have been mixed for more than 45 minutes shall not be used unless otherwise permitted by the Engineer.

Section 53-1.07, "Measurement," of the Standard Specifications is amended to read:

- Quantities of shotcrete will be measured by the cubic meter 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.

Section 53-1.08, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per cubic meter 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 55: STEEL STRUCTURES

Issue Date: January 5, 2007

The third and fourth paragraphs of Section 55-1.01, "Description," of the Standard Specifications are amended to read:

- Details of connections for highway bridges selected for use by the Contractor shall conform to the AASHTO LRFD Bridge Design Specifications with Caltrans Amendments.
- Details of design selected by the Contractor, fabrication and workmanship, for steel railway bridges shall conform to the requirements of the Specifications for Steel Railway Bridges, for Fixed Spans Not Exceeding 400 Feet in Length of the AREMA, as set forth in the special provisions.

The third paragraph of Section 55-1.05, "Falsework," of the Standard Specifications is amended to read:

- Construction methods and equipment employed by the Contractor shall conform to the provisions in Section 7-1.02, "Load Limitations." Loads imposed on existing, new or partially completed structures shall not exceed the load carrying capacity of the structure, or portion of structure, as determined by the AASHTO LRFD Bridge Design Specifications with Caltrans Amendments.

The fourth and fifth paragraphs of Section 55-2.01, "Description," of the Standard Specifications are amended to read:

- All structural steel plate used for the fabrication of tension members, tension flanges, eyebars and hanger plates and for splice plates of tension members, tension flanges and eyebars shall meet the longitudinal Charpy V-notch impact value requirements specified herein. Sampling procedures shall conform to the requirements in ASTM Designation: A 673. The H (Heat) frequency of testing shall be used for structural steels conforming to the requirements in ASTM Designations: A 709/A 709M, Grades 36 [250], 50 [345], 50W [345W], and HPS 50W [345W]. The P (Piece) frequency of testing shall be used for structural steel conforming to the requirements in ASTM Designation: A 709/A 709M, Grades HPS 70W [485W], 100 [690], and 100W [690W]. Charpy V-notch impact values shall be determined in conformance with the requirements in ASTM Designation: E 23.

- Charpy V-notch (CVN) impact values shall conform to the following minimum values for non fracture critical members:

Material Conforming to ASTM Designation: A 709/A 709M	CVN Impact Value (Joules at Temp.)
Grade 36 [250]	20 at 4°C
Grade 50 [345]* (50 mm and under in thickness)	20 at 4°C
Grade 50W [345W]* (50 mm and under in thickness)	20 at 4°C
Grade 50 [345]* (Over 50 mm to 100 mm in thickness)	27 at 4°C
Grade 50W [345W]* (Over 50 mm to 100 mm in thickness)	27 at 4°C
Grade HPS 50W [345W]* (100 mm and under in thickness)	27 at -12°C
Grade HPS 70W [485]* (100 mm and under in thickness)	34 at -23°C
Grade 100 [490] (65 mm and under in thickness)	34 at -18°C
Grade 100W [490W] (Over 65 mm to 100 mm in thickness)	48 at -18°C

* If the yield point of the material exceeds 450 MPa, the temperature for the CVN impact value for acceptability shall be reduced 8°C for each increment of 70 MPa above 450 MPa.

Structural Steel Materials

Material	Specification
Structural steel:	
Carbon steel	ASTM: A 709/A 709M, Grade 36 [250] or {A 36/A 36M}a
High strength low alloy columbium vanadium steel	ASTM: A 709/A 709M, Grade 50 [345] or {A 572/A 572M, Grade 50 [345]}a
High strength low alloy structural steel	ASTM: A 709/A 709M, Grade 50W [345W], Grade HPS 50W [HSP 345W], or {A 588/A 588M}a
High strength low alloy structural steel plate	ASTM: A 709/A 709M, Grade HPS 70W [HPS 485W]
High-yield strength, quenched and tempered alloy steel plate suitable for welding	ASTM: A 709/A 709M, Grade 100 [690] and Grade 100W [690W], or {A 514/A 514M}a
Steel fastener components for general applications:	
Bolts and studs	ASTM: A 307
Headed anchor bolts	ASTM: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO: M 314 supplementary requirements or AASHTO: M 314, Grade 36 or 55, including S1 supplementary requirements
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: A 449, Type 1
Nuts	ASTM: A 563, including Appendix X1b
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 X1b
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, Grade 32510 or A 47M, 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	ASTM: A 108 and 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.

The first sentence of the first paragraph of Section 55-2.02, "Structural Steel," of the Standard Specifications is amended to read:

- Unless otherwise specified or shown on the plans, all structural steel plates, shapes, and bars shall conform to ASTM Designation: A 709/A 709M, Grade 50 [345].

The first paragraph in Section 55-3.05, "Flatness of Faying and Bearing Surfaces," of the Standard Specifications is amended to read:

- Surfaces of bearing and base plates and other metal surfaces that are to come in contact with each other or with ground concrete surfaces or with asbestos sheet packing shall be flat to within one mm tolerance in 305 mm and to within 2 mm 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 3 mm tolerance in 305 mm and to within 5 mm tolerance overall.

Section 55-3.14, "Bolted Connections," of the Standard Specifications is amended by adding the following after the ninth paragraph:

- If a torque multiplier is used in conjunction with a calibrated wrench as a method for tightening fastener assemblies to the required tension, both the multiplier and the wrench shall be calibrated together as a system. The same length input and output sockets and extensions that will be used in the work shall also be included in the calibration of the system. The manufacturer's torque multiplication ratio shall be adjusted during calibration of the system, such that when this adjusted ratio is multiplied by the actual input calibrated wrench reading, the product is a calculated output torque that is within 2 percent of the true output torque. When this system is used in the work to perform any installation tension testing, rotational capacity testing, fastener tightening, or tension verification, it shall be used, intact as calibrated.

The second paragraph of Section 55-3.17, "Welding," of the Standard Specifications is amended to read:

- The minimum size of all fillet welds, except those to reinforce groove welds, shall be as shown in the following table:

Base Metal Thickness of the Thicker Part Joined (Millimeters)	*Minimum Size of Fillet Weld (Millimeters)
To 19 inclusive	6
Over 19	8

* Except that the weld size need not exceed the thickness of the thinner part joined.

The third paragraph in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications is amended to read:

- 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.

The fifth paragraph in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications is amended to read:

- Mortar to be placed below masonry plates or bearing plates of the bearing assemblies and in anchor bolt sleeves or canisters shall conform to the provisions in Section 51-1.135, "Mortar," except that the proportion of cementitious material to sand shall be 1:3.

The sixth paragraph of Section 55-4.02, "Payment," of the Standard Specifications is amended to read:

- If a portion or all of the structural steel is fabricated more than 480 air line kilometers 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 these expenses, it is agreed that payment to the Contractor for furnishing the structural steel from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$5000 or by an amount computed at \$0.044 per kilogram of structural steel fabricated, whichever is greater, or in the case of each fabrication site located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced \$8000 or by \$0.079 per kilogram of structural steel fabricated, whichever is greater.

SECTION 56: SIGNS

Issue Date: March 16, 2007

Section 56-1.01, "Description," of the Standard Specifications is amended by deleting the third paragraph.

Section 56-1.02A, "Bars, Plates and Shapes," of the Standard Specifications is amended to read:

56-1.02A Bars, Plates, Shapes, and Structural Tubing

- Bars, plates, and shapes shall be structural steel conforming to the requirements in ASTM Designation: A 36/A 36M, except, at the option of the Contractor, the light fixture mounting channel shall be continuous-slot steel channel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation SS, Grade 33[230], or aluminum Alloy 6063-T6 extruded aluminum conforming to the requirements in ASTM Designation: B 221 or B 221M.
- Structural tubing shall be structural steel conforming to the requirements in ASTM Designation: A 500, Grade B.
- Removable sign panel frames shall be constructed of structural steel conforming to the requirements in ASTM Designation: A 36/A 36M.

Section 56-1.02B, "Sheets," of the Standard Specifications is amended to read:

56-1.02B Sheets

- Sheets shall be carbon-steel sheets conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation SS, Grade 33[230].

- Ribbed sheet metal for box beam-closed truss sign structures shall be fabricated from galvanized sheet steel conforming to the requirements in ASTM Designation: A 653/A 653M, Designation SS, Grade 33[230]. Sheet metal panels shall be G 165 coating designation in conformance with the requirements in ASTM Designation: A 653/A 653M.

Section 56-1.02F, "Steel Walkway Gratings," of the Standard Specifications is amended to read:

56-1.02F Steel Walkway Gratings

- Steel walkway gratings shall be furnished and installed in conformance with the details shown on the plans and the following provisions:
 - A. Gratings shall be the standard product of an established grating manufacturer.
 - B. Material for gratings shall be structural steel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation CS, Type B.
 - C. For welded type gratings, each joint shall be full resistance welded under pressure, to provide a sound, completely beaded joint.
 - D. For mechanically locked gratings, the method of fabrication and interlocking of the members shall be approved by the Engineer, and the fabricated grating shall be equal in strength to the welded type.
 - E. Gratings shall be accurately fabricated and free from warps, twists, or other defects affecting their appearance or serviceability. Ends of all rectangular panels shall be square. The tops of the bearing bars and cross members shall be in the same plane. Gratings distorted by the galvanizing process shall be straightened.

The fifth paragraph in Section 56-1.03, "Fabrication," of the Standard Specifications is amended to read:

- 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.

The sixth through the thirteenth paragraphs in Section 56-1.03, "Fabrication," of the Standard Specifications are amended to read:

- High-strength bolted connections, where shown on the plans, shall conform to the provisions in Section 55-3.14, "Bolted Connections," except that only fastener assemblies consisting of a high-strength bolt, nut, hardened washer, and direct tension indicator shall be used.
 - High-strength fastener assemblies, and any other bolts, nuts, and washers attached to sign structures shall be zinc-coated by the mechanical deposition process.
 - Nuts for high-strength bolts designated as snug-tight shall not be lubricated.
 - An alternating snugging and tensioning pattern for anchor bolts and high-strength bolted splices shall be used. Once tensioned, high-strength fastener components and direct tension indicators shall not be reused.
 - For bolt diameters less than 10 mm, the diameter of the bolt hole shall be not more than 0.80-mm larger than the nominal bolt diameter. For bolt diameters greater than or equal to 10 mm, the diameter of the bolt hole shall be not more than 1.6 mm larger than the nominal bolt diameter.
 - Sign structures shall be fabricated into the largest practical sections prior to galvanizing.
 - Ribbed sheet metal panels for box beam closed truss sign structures shall be fastened to the truss members by cap screws or bolts as shown on the plans, or by 4.76 mm stainless steel blind rivets conforming to Industrial Fasteners Institute, Standard IFI-114, Grade 51. The outside diameter of the large flange rivet head shall be not less than 15.88 mm in diameter. Web splices in ribbed sheet metal panels may be made with similar type blind rivets of a size suitable for the thickness of material being connected.
 - Spalling or chipping of concrete structures shall be repaired by the Contractor at the Contractor's expense.
 - Overhead sign supports shall have an aluminum identification plate permanently attached near the base, adjacent to the traffic side on one of the vertical posts, using either stainless steel rivets or stainless steel screws. As a minimum, the information on the plate shall include the name of the manufacturer, the date of manufacture and the contract number.

The fourth paragraph of Section 56-1.10, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per kilogram 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.

The fifth paragraph of Section 56-2.02B, "Wood Posts," of the Standard Specifications is amended to read:

- Douglas fir and Hem-Fir posts shall be treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and in conformance with AWPAs Use Category System: UC4A, Commodity Specification A. Posts shall be incised and the minimum retention of preservative shall be as specified in AWPAs Standards.

The fourth paragraph in Section 56-2.03, "Construction," of the Standard Specifications is amended to read:

- 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 275 kilograms of cementitious material per cubic meter.

SECTION 57: TIMBER STRUCTURES

Issue Date: October 12, 2004

The second paragraph of Section 57-1.02A, "Structural Timber and Lumber," of the Standard Specifications is amended to read:

- When preservative treatment of timber and lumber is required, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPAs Use Category 4B. The type of treatment to be used will be shown on the plans or specified in the special provisions.

SECTION 58: PRESERVATIVE TREATMENT OF LUMBER, TIMBER AND PILING

Issue Date: November 18, 2005

The first paragraph of Section 58-1.02, "Treatment and Retention," of the Standard Specifications is amended to read:

- Timber, lumber, and piling shall be pressure treated after millwork is completed. Preservatives, treatment, and results of treatment shall conform to the requirements in AWPAs Standards U1 and T1. Treatment of lumber and timber shall conform to the specified AWPAs Use Category cited in the special provisions, on the plans, or elsewhere in these specifications.

The second paragraph of Section 58-1.02, "Treatment and Retention," of the Standard Specifications is deleted.

SECTION 59: PAINTING

Issue Date: January 19, 2007

The first paragraph of Section 59-1.02, "Weather Conditions," of the Standard Specifications is amended to read:

- Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather. Blast cleaning or application of solvent-borne paint will not be permitted when the atmospheric or surface temperature is at or below 2°C or above 38°C, or when the relative humidity exceeds 85 percent at the site of the work. Application of water-borne paint will not be permitted when the atmospheric or surface temperature is at or below 10°C, or above 38°C, or when the relative humidity exceeds 75 percent at the site of the work. Application of paint will not be permitted when the steel surface temperature is less than 3°C above the dew point, or when freshly painted surfaces may become damaged by rain, fog or condensation, or when it can be anticipated that the atmospheric temperature or relative humidity will not remain within the specified application conditions during the drying period, except as provided in the following paragraph for enclosures. If uncured paint is damaged by the elements, it shall be replaced or repaired by the Contractor at the Contractor's expense.

The second paragraph of Section 59-1.05, "Protection Against Damage," of the Standard Specifications is amended to read:

- Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at the Contractor's expense and to the satisfaction of the Engineer.

Section 59-2.01, "General," of the Standard Specifications is amended by adding the following paragraphs after the first paragraph:

- Unless otherwise specified, no painting Contractors or subcontractors will be permitted to commence work without having the following current "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council) certifications in good standing:
 - 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 Evaluating Painting Contractors (Field Removal of Hazardous Coatings from Complex Structures)" (SSPC-QP 2).
 - C. For cleaning and painting structural steel in a permanent painting facility, certification in conformance with the requirements in Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Applicators" (SSPC-QP 3). The AISC's Sophisticated Paint Endorsement (SPE) quality program will be considered equivalent to SSPC-QP 3.

The third paragraph of Section 59-2.03, "Blast Cleaning," of the Standard Specifications is amended to read:

- Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "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 35 μm as measured in conformance with the requirements in ASTM Designation: D 4417.

The first paragraph of Section 59-2.06, "Hand Cleaning," of the Standard Specifications is amended to read:

- Dirt, loose rust and mill scale, or paint which is not firmly bonded to the surfaces shall be removed in conformance with the requirements in Surface Preparation Specification No. 2, "Hand Tool Cleaning," of the "SSPC: The Society for Protective Coatings." Edges of old remaining paint shall be feathered.

The third and fourth paragraphs of Section 59-2.12, "Painting," of the Standard Specifications are amended to read:

- 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.

The third paragraph of Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications is amended to read:

- Mechanical mixers shall be used in mixing the primer. After mixing, the zinc-rich primer shall be strained through a 0.6 to 0.25 mm screen or a double layer of cheesecloth immediately prior to or during pouring into the spray pot.

SECTION 64: PLASTIC PIPE

Issue Date: July 31, 2007

The first paragraph of Section 64-1.06, "Concrete Backfill," of the Standard Specifications is amended to read:

- 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 250 kg of cementitious material per cubic meter. The concrete to be used will be designated in the contract item or shown on the plans.

The third paragraph of Section 64-1.06, "Concrete Backfill," of the Standard Specifications is amended to read:

- 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

Issue Date: July 31, 2007

The first paragraph of Section 65-1.02, "Materials," of the Standard Specifications is amended to read:

- Cementitious material and aggregate shall conform to the provisions in Section 90-2, "Materials," except that mortar strengths relative to Ottawa sand and grading requirements shall not apply to the aggregate. Use of supplemental cementitious material shall conform to AASHTO Designation: M 170M.

Subparagraph "c" of the eleventh paragraph of Section 65-1.02A(1) "Circular Reinforced Concrete Pipe (Designated or Selected by Class)," of the Standard Specifications is amended to read:

c. Cementitious material and aggregate for non-reinforced concrete pipe shall conform to the provisions in Section 65-1.02, "Materials."

The first paragraph of Section 65-1.035, "Concrete Backfill," of the Standard Specifications is amended to read:

- 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 225 kg of cementitious material per cubic meter. The concrete to be used will be designated in the contract item.

The third paragraph of Section 65-1.035, "Concrete Backfill," of the Standard Specifications is amended to read:

- 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.

The first subparagraph of the second paragraph of Section 65-1.06, "Joints," of the Standard Specifications is amended to read:

- Cement Mortar.- Mortar shall be composed of one part cementitious material and 2 parts sand by volume. Supplementary cementitious material will not be required.

SECTION 66: CORRUGATED METAL PIPE

Issue Date: July 31, 2007

The first paragraph of Section 66-1.045, "Concrete Backfill," of the Standard Specifications is amended to read:

- 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 225 kg of cementitious material per cubic meter. The concrete to be used will be designated in the contract item or shown on the plans.

The third paragraph of Section 66-1.045, "Concrete Backfill," of the Standard Specifications is amended to read:

- 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 68: SUBSURFACE DRAINS

Issue Date: July 31, 2007

The first and second paragraphs of Section 68-3.02D, "Miscellaneous," of the Standard Specifications are amended to read:

- 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 275 kg of cementitious material per cubic meter.
- 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."

The thirteenth paragraph of Section 68-3.03, "Installation," of the Standard Specifications is amended to read:

- 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.

The seventeenth and eighteenth paragraphs of Section 68-3.03, "Installation," of the Standard Specifications are amended to read:

- 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 19 mm grading, or the 12.5 mm 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 120°C. 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 0.25 liters per square meter.

The twentieth paragraph of Section 68-3.03, "Installation," of the Standard Specifications is amended to read:

- 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.

Section 68-3.05, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per meter 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 meter 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

Issue Date: July 31, 2007

The first paragraph of Section 69-1.01, "Description," of the Standard Specifications is amended to read:

- 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.

Section 69-1.02D, "Asphalt Concrete," of the Standard Specifications is amended to read:

69-1.02D Hot Mix Asphalt

- Hot mix asphalt for overside drains shall conform to the provisions in Section 39-1.13, "Miscellaneous Areas."

Section 69-1.04, "Asphalt Concrete Overside Drains," is amended to read:

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."

The second paragraph of Section 69-1.06, "Payment," of the Standard Specifications is amended to read:

- 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

Issue Date: January 5, 2007

The second paragraph of Section 70-1.02C, "Flared End Sections," of the Standard Specifications is amended to read:

- 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 mortar strengths relative to Ottawa sand and grading requirements shall not apply to the aggregate. Use of supplementary cementitious material shall conform to the requirements in AASHTO Designation: M 170M. The area of steel reinforcement per meter 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 170M.

The first paragraph of Section 70-1.02H, "Precast Concrete Structures," of the Standard Specifications is amended to read:

- 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, except that the cementitious material and aggregate shall conform to the provisions in Section 90-2, "Materials," except that mortar strengths relative to Ottawa sand and grading requirements shall not apply to the aggregate. Use of supplementary cementitious material shall conform to the requirements in AASHTO Designation: M 170M.

The second paragraph of Section 70-1.03, "Installation," of the Standard Specifications is amended to read:

- 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 275 kg of cementitious material per cubic meter.

SECTION 72: SLOPE PROTECTION

Issue Date: November 18, 2005

The sixth paragraph of Section 72-4.04, "Construction," of the Standard Specifications is amended to read:

- Pervious backfill material, if required by the plans, shall be placed as shown. A securely tied sack containing 0.03-m³ of pervious backfill material shall be placed at each weep hole and drain hole. The sack material shall conform to the provisions in Section 88-1.03, "Filter Fabric."

SECTION 73: CONCRETE CURBS AND SIDEWALKS

Issue Date: July 31, 2007

The second subparagraph of the second paragraph of Section 73-1.01, "Description," of the Standard Specifications is amended to read:

2. Minor concrete shall contain not less than 275 kg of cementitious material per cubic meter except that when extruded or slip-formed curbs are constructed using 9.5-mm maximum size aggregate, minor concrete shall contain not less than 325 kg of cementitious material per cubic meter.

The fifteenth paragraph of Section 73-1.06, "Sidewalk, Gutter Depression, Island Paving, Curb Ramp (Wheelchair Ramp) and Driveway Construction," of the Standard Specifications is amended to read:

- 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 75: MISCELLANEOUS METAL

Issue Date: January 18, 2008

The table in the tenth paragraph of Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications is amended to read:

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: 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 [450-240], Class 1
Malleable iron castings	ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM Designation: A 48, Class 30B
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.

The second paragraph in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- Miscellaneous bridge metal shall consist of the following, except as further provided in Section 51-1.19, "Utility Facilities," and in the special provisions:

- A. Bearing assemblies, equalizing bolts and expansion joint armor in concrete structures.
- B. Expansion joint armor in steel structures.
- C. Manhole frames and covers, frames and grates, ladder rungs, guard posts and access door assemblies.
- D. Deck drains, area drains, retaining wall drains, and drainage piping, except drainage items identified as "Bridge Deck Drainage System" in the special provisions.

The seventh paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- Sheet steel for access doors shall be galvanized sheet conforming to the requirements in ASTM Designation: A 653/A 653M, Coating Designation Z600 {G210}.

The 13th paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- 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 at:

http://www.dot.ca.gov/hq/esc/approved_products_list

- 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 ANSI Standard: B1.1 having Class 2A tolerances or ANSI Standard: B1.13M having Grade 6g tolerances. Thread dimensions for internally threaded concrete anchorage devices shall conform to the requirements in ASTM A 563.

The 18th paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- 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 0.90 mm:

Stud Diameter (millimeters)	Sustained Tension Test Load (kilonewtons)
*18.01-21.00	22.2
15.01-18.00	18.2
12.01-15.00	14.2
9.01-12.00	9.34
6.00-9.00	4.23

* 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 0.25 mm:

Stud Diameter (millimeters)	Sustained Tension Test Load (kilonewtons)
29.01-33.00	137.9
23.01-29.00	79.6
21.01-23.00	64.1
18.01-21.00	22.2
15.01-18.00	18.2
12.01-15.00	14.2
9.01-12.00	9.34
6.00-9.00	4.23

- 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.

The table in the nineteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Stud Diameter (millimeters)	Ultimate Tensile Load (kilonewtons)
30.01-33.00	112.1
27.01-30.00	88.1
23.01-27.00	71.2
20.01-23.00	51.6
16.01-20.00	32.0
14.01-16.00	29.4
12.00-14.00	18.7

The 20th paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- The Pre-Qualified Products List for concrete anchorage devices has been developed from data previously furnished by suppliers or manufacturers for each type and size. Approval of additional anchorage device types and sizes is contingent upon the Contractor submitting to the Engineer one sample of each type of concrete anchorage device, manufacturer's installation instructions, and certified results of tests, either by a private testing laboratory or the manufacturer, indicating compliance with the above requirements.

The table in the twenty-second paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Installation Torque Values, (newton meters)

Stud Diameter (millimeters)	Shell Type Mechanical Expansion Anchors	Integral Stud Type Mechanical Expansion Anchors	Resin Capsule Anchors and Cast-in-Place Inserts
29.01-33.00	—	—	540
23.01-29.00	—	—	315
21.01-23.00	—	—	235
18.01-21.00	110	235	200
15.01-18.00	45	120	100
12.01-15.00	30	65	40
9.01-12.00	15	35	24
6.00-9.00	5	10	—

The twenty-fourth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- 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.

The third paragraph in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications is amended to read:

- Cables shall be 19 mm 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 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer.

The twelfth paragraph in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications is amended to read:

- 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 9.5 mm maximum size aggregate and not less than 400 kilograms of cementitious material per cubic meter.

The second paragraph in Section 75-1.05, "Galvanizing," of the Standard Specifications is amended to read:

- At the option of the Contractor, material thinner than 3.2 mm shall be galvanized either before fabrication in conformance with the requirements of ASTM Designation: A 653/A 653M, Coating Designation Z600, or after fabrication in conformance with the requirements of ASTM Designation: A 123, except that the weight of zinc coating shall average not less than 365 g per square meter of actual surface area with no individual specimen having a coating weight of less than 305 g per square meter.

SECTION 80: FENCES

Issue Date: January 5, 2007

The second paragraph of Section 80-3.01B(2), "Treated Wood Posts and Braces," of the Standard Specifications is amended to read:

- Posts and braces to be treated shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWP A Use Category System: UC4A, Commodity Specification A or B.

The fourth paragraph of Section 80-3.01F, "Miscellaneous," of the Standard Specifications is amended to read:

- 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 275 kg of cementitious material per cubic meter.

The fourth paragraph of Section 80-4.01C, "Miscellaneous," of the Standard Specifications is amended to read:

- 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 275 kg of cementitious material per cubic meter.

SECTION 81: MONUMENTS

Issue Date: June 30, 2006

The fifth paragraph of Section 81-1.02, "Materials," of the Standard Specifications is amended to read:

- At the option of the Contractor, the frame and cover for Type B and Type D survey monuments shall be fabricated from either cast steel or gray cast iron. The covers shall fit into the frames without rocking.

The seventh paragraph of Section 81-1.02, "Materials," of the Standard Specifications is amended to read:

- Granular material for Type B and Type D survey monuments shall be gravel, crushed gravel, crushed rock or any combination thereof. Granular material shall not exceed 37.5 mm in greatest dimension.

SECTION 82: MARKERS AND DELINEATORS

Issue Date: June 30, 2006

The first paragraph of Section 82-1.02B, "Metal Posts," of the Standard Specifications is amended to read:

- Steel for metal posts shall conform to the requirements in ASTM Designation: A 36/A 36M. The posts shall be galvanized in conformance with the requirements in Section 75-1.05, "Galvanizing."

The third paragraph of Section 82-1.02D, "Target Plates," of the Standard Specifications is amended to read:

- The zinc-coated steel sheet shall conform to the requirements in ASTM Designation: A 653/A 653M, Classification: Commercial Steel (CS Types A, B and C). The steel sheets shall be galvanized in conformance with the requirements in Section 75-1.05, "Galvanizing." The zinc-coated surface shall be prepared for painting in a manner designed to produce optimum paint adherence. The surface preparation shall be accomplished without damaging or removing the zinc coating. Any evidence of damage or removal of the zinc coating shall be cause for rejection of the entire lot.

The eleventh paragraph of Section 82-1.02D, "Target Plates," of the Standard Specifications is amended to read:

- When tested in conformance with the requirements in California Test 671, the painted metal target plates shall, in general, have satisfactory resistance to weathering, humidity, salt spray and chemicals; the enamel coating shall have satisfactory adherence and impact resistance, a pencil lead hardness of HB minimum, 60° specular gloss of 80 percent minimum, an excitation purity of 3 percent maximum as received and after 1000 hours in an artificial weathering device in conformance with the requirements in ASTM Designation: G 155, Table X3.1, Cycle 1, and a daylight luminous directional reflectance ("Y" value) of 70 minimum.

The second paragraph of Section 82-1.02F, "Reflectors," of the Standard Specifications is amended to read:

- Reflectors for flexible target plates on Type K object markers and target plates on Class 2 delineators, and reflectors for Class 1 delineators shall be made from impact resistant retroreflective sheeting as specified in the special provisions. The color of the retroreflective sheeting shall conform to the color designated on the plans and the Chromaticity Coordinates specified in ASTM Designation: D 4956, or the PR color number specified by the Federal Highway Administration's Color Tolerance Chart.

The fourth paragraph of Section 82-1.02F, "Reflectors," of the Standard Specifications is amended to read:

The instrumental method of determining color shall conform to the requirements specified in ASTM Designation: D 4956. In the event of any dispute concerning the test results of instrumental testing, the visual test shall prevail.

SECTION 83: RAILINGS AND BARRIERS

Issue Date: August 17, 2007

The seventh paragraph in Section 83-1.02, "Materials and Construction," of the Standard Specifications is amended to read:

- 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.

The first paragraph of Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- The rail elements, backup plates, terminal sections, end and return caps, bolts, nuts and other fittings shall conform to the requirements in AASHTO Designation: M 180, except as modified in this Section 83-1.02B and as specified in Section 83-1.02. The rail elements, backup plates, terminal sections, end and return caps shall conform to Class A, Type 1 W-Beam guard railing as shown in AASHTO Designation: M 180. The edges and center of the rail element shall contact each post block. Rail element joints shall be lapped not less than 316 mm and bolted. The rail metal, in addition to conforming to the requirements in AASHTO Designation: M 180, shall withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2.5 times the thickness of the plate.

The ninth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- The grades and species of wood posts and blocks shall be No. 1 timbers (also known as No. 1 structural) Douglas fir or No. 1 timbers Southern yellow pine. Wood posts and blocks shall be graded in conformance with the provisions in Section 57-2, "Structural Timber," of the Standard Specifications, except allowances for shrinkage after mill cutting shall in no case exceed 5 percent of the American Lumber Standards minimum sizes, at the time of installation.

The eleventh paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- After fabrication, wood posts and blocks shall be pressure treated in conformance with Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWP A Use Category System: UC4A, Commodity Specification A.

The twelfth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- If copper naphthenate, ammoniacal copper arsenate, chromated copper arsenate, ammoniacal copper zinc arsenate, ammoniacal copper quat or copper azole is used to treat the wood posts and blocks, the bolt holes shall be treated as follows:
 - A. Before the bolts are inserted, bolt holes shall be filled with a grease, recommended by the manufacturer for corrosion protection, which will not melt or run at a temperature of 65°C.

The twenty-fourth paragraph of Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- End anchor assemblies and rail tensioning assemblies for metal beam guard railing shall be constructed as shown on the plans and shall conform to the following provisions:
 1. An end anchor assembly (Type SFT) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a wood post, a steel foundation tube, a steel soil plate and hardware.
 2. An end anchor assembly (Type CA) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a single anchor rod or double anchor rods, hardware and one concrete anchor.
 3. A rail tensioning assembly for metal beam guard railing shall consist of an anchor cable, an anchor plate, and hardware.
 4. The anchor plate, metal plates, steel foundation tubes and steel soil plate shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M.
 5. The anchor rods shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M, A 441 or A 572, or ASTM Designation: A 576, Grades 1018, 1019, 1021 or 1026. The eyes shall be hot forged or formed with full penetration welds. After fabrication, anchor rods with eyes that have been formed with any part of the eye below 870°C during the forming operation or with eyes that have been closed by welding shall be thermally stress relieved prior to galvanizing. The completed anchor rod, after galvanizing, shall develop a strength of 220 kN.
 6. In lieu of built-up fabrication of anchor plates as shown on the plans, anchor plates may be press-formed from steel plate, with or without welded seams.
 7. All bolts and nuts shall conform to the requirements in ASTM Designation: A 307, unless otherwise specified in the special provisions or shown on the plans.

8. Anchor cable shall be 19 mm 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 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer. The overall length of each cable anchor assembly shall be as shown on the plans, but shall be a minimum of 2 m.
9. Where shown on the plans, cable clips and a cable thimble shall be used to attach cable to the anchor rod. Thimbles shall be commercial quality, galvanized steel. Cable clips shall be commercial quality drop forged galvanized steel.
10. The swaged fitting shall be machined from hot-rolled bars of steel conforming to AISI Designation: C 1035, and shall be annealed suitable for cold swaging. The swaged fitting shall be galvanized before swaging. A lock pin hole to accommodate a 6 mm, plated, spring steel pin shall be drilled through the head of the swage fitting to retain the stud in proper position. The manufacturer's identifying mark shall be stamped on the body of the swage fitting.
11. The 25 mm nominal diameter stud shall conform to the requirements in ASTM Designation: A 449 after galvanizing. Prior to galvanizing, a 10 mm slot for the locking pin shall be milled in the stud end.
12. The swaged fittings, stud and nut assembly shall develop the specified breaking strength of the cable.
13. The cable assemblies shall be shipped as a complete unit including stud and nut.
14. Clevises shall be drop forged galvanized steel and shall develop the specified breaking strength of the cable.
15. One sample of cable properly fitted with swaged fitting and right hand thread stud at both ends as specified above, including a clevis when shown on the plans, one meter in total length, shall be furnished the Engineer for testing.
16. The portion of the anchor rod to be buried in earth shall be coated with a minimum 0.5 mm thickness of coal tar enamel conforming to AWWA Standard: C203 or a coal tar epoxy conforming to the requirements in Steel Structures Painting Council Paint Specification No. 16, Coal-Tar Epoxy-Polyimide Black Paint or Corps of Engineers Specification, Formula C-200a, Coal-Tar Epoxy Paint.
17. Metal components of the anchor assembly shall be fabricated in conformance with good shop practice and shall be hot-dip galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."
18. Anchor cables shall be tightened after the concrete anchor has cured for at least 5 days.
19. Concrete used to construct anchors for end anchor assemblies shall be Class 3 or minor concrete conforming to the provisions in Section 90, "Portland Cement Concrete."
20. Concrete shall be placed against undisturbed material of the excavated holes for end anchors. The top 300 mm of holes shall be formed, if required by the Engineer.
21. Reinforcing steel in concrete anchors for end anchor assemblies shall conform to the provisions in Section 52, "Reinforcement."

The second paragraph in Section 83-1.02D, "Steel Bridge Railing," of the Standard Specifications is amended to read:

- Structural shapes, tubing, plates, bars, bolts, nuts, and washers shall be structural steel conforming to the provisions in Section 55-2, "Materials." Other fittings shall be commercial quality.

The second and third paragraphs in Section 83-1.02E, "Cable Railing," of the Standard Specifications are replaced with the following paragraph:

- Pipe for posts and braces shall be standard steel pipe or pipe that conforms to the provisions in Section 80-4.01A, "Posts and Braces."

The 2nd sentence of the 7th paragraph of Section 83-1.02E, "Cable Railing," of the Standard Specifications is amended to read:

- Cable shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

The 5th paragraph of Section 83-1.02I, "Chain Link Railing," of the Standard Specifications is amended to read:

- Where shown on the plans, cables used in the frame shall be 8 mm in diameter, wire rope, with a minimum breaking strength of 22 kN and shall be galvanized in conformance with the requirements in Federal Specification RR-W-410.

The 14th paragraph of Section 83-1.02I, "Chain Link Railing," of the Standard Specifications is amended to read:

- Chain link fabric shall be either 11-gage Type I zinc-coated fabric conforming to the requirements in AASHTO M 181 or 11-gage Type IV polyvinyl chloride (PVC) coated fabric conforming to the requirements in Federal Specification RR-F-191/1.

The second paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- Except for metal beam guard railing within the pay limits of a terminal system end treatment or transition railing (Type WB), metal beam guard railing will be measured by the meter along the face of the rail element from end post to end post of the completed railing at each installation. The point of measurement at each end post will be the center of the bolt attaching the rail element to the end post.

The seventh paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- The quantities of end anchor assemblies (Type SFT or Type CA) and rail tensioning assemblies will be measured as units determined from actual count. An end anchor assembly (Type CA) with 2 cables attached to one concrete anchor will be counted as one terminal anchor assembly (Type CA) for measurement and payment.

The eighth paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- The quantities of return and end caps and the various types of terminal sections for metal beam guard railing will be determined as units from actual count.

The third paragraph of Section 83-1.04, "Payment," of the Standard Specifications is amended to read:

- The contract unit prices paid for end anchor assembly (Type SFT), end anchor assembly (Type CA), and rail tensioning assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the end anchor assemblies, complete in place, including drilling anchor plate bolt holes in rail elements, driving steel foundation tubes, excavating for concrete anchor holes and disposing of surplus material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The fourth paragraph of Section 83-1.04, "Payment," of the Standard Specifications is amended to read:

- The contract unit prices paid for return caps, end caps, and the various types of terminal sections for metal beam guard railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing terminal sections, return and end caps, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The second paragraph of Section 83-2.02B, "Thrie Beam Barrier," of the Standard Specifications is amended to read:

- Rail elements, backup plates, terminal connectors, terminal sections, and return caps shall conform to Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

The fourteenth paragraph of Section 83-2.02B, "Thrie Beam Barrier," of the Standard Specifications is amended to read:

- All metal work shall be fabricated in the shop, and no punching, cutting or welding will be permitted in the field. Rail elements shall be lapped so that the exposed ends will not face approaching traffic. Terminal sections and return caps shall be installed in conformance with the manufacturer's recommendation.

The first paragraph in Section 83-2.02D(2), "Materials," of the Standard Specifications is amended to read:

- Type 50 and 60 series concrete barriers shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," except as follows:
 - a. The maximum size of aggregate used for extruded or slip-formed concrete barriers shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5-mm or smaller than 9.5-mm.
 - b. If the 9.5 mm 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 400 kilograms per cubic meter.

The third paragraph in Section 83-2.02D(2), "Materials," of the Standard Specifications is amended to read:

- The concrete paving between the tops of the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) and the optional concrete slab at the base between the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) 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 300 kilograms of cementitious material per cubic meter.

The first paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- Except for single thrie beam barrier within the pay limits of transition railing (Type STB), single thrie beam barrier will be measured by the meter from end post to end post along the face of the rail element of the installed barrier. Single thrie beam barriers constructed on each side of piers under structures or other obstructions will be measured for payment along each line of the installed barrier.

The second paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- Except for double thrie beam barrier within the pay limits of transition railing (Type DTB), double thrie beam barrier will be measured by the meter from end post to end post along the center line of the installed barrier.

The fifth paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- The quantity of return caps, terminal connectors and the various types of terminal sections for single and double thrie beam barriers will be determined as units from actual count.

The sixth paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- The quantity of end anchor assemblies will be paid for as units determined from actual count.

The first paragraph of Section 83-2.04, "Payment," of the Standard Specifications is amended to read:

- The various types of thrie beam barrier, measured as specified in Section 83-2.03, "Measurement," will be paid for at the contract price per meter for single or double thrie beam barrier, whichever applies, and the contract unit price or prices for end anchor assemblies, return caps, terminal connectors and the various types of terminal sections.

The second paragraph of Section 83-2.04, "Payment," of the Standard Specifications is amended to read:

- 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 constructing the barrier, complete in place, including drilling holes for wood posts, driving posts, backfilling the space around posts, excavating and backfilling end anchor assembly holes, connecting thrie beam barrier to concrete surfaces and disposing of surplus excavated material, and for furnishing, placing, removing and disposing of the temporary railing for closing the gap between existing barrier and the barrier being constructed as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

The fourth paragraph in Section 83-2.04, "Payments," of the Standard Specifications is amended to read:

- Steel plate barrier attached to concrete barrier at overhead sign foundations, electroliers, drainage structures, and other locations shown on the plans will be measured and paid for as the type of concrete barrier attached thereto.

SECTION 84: TRAFFIC STRIPES AND PAVEMENT MARKINGS

Issue Date: July 21, 2006

The first paragraph of Section 84-2.02, "Materials," of the Standard Specifications is amended to read:

- The thermoplastic material shall conform to State Specification PTH-02SPRAY, PTH-02HYDRO or PTH-02ALKYD. Glass beads to be applied to the surface of the molten thermoplastic material shall conform to the requirements of State Specification 8010-004 (Type II).

The first paragraph of Section 84-3.02, "Materials," of the Standard Specifications is amended to read:

- Paint for traffic stripes and pavement markings shall conform to the following State Specifications:

Paint Type	Color	State Specification No.
Waterborne Traffic Line	White, Yellow and Black	PTWB-01
Acetone-Based	White, Yellow and Black	PT-150VOC(A)
Waterborne Traffic Line for disabled persons' parking, and other curb markings	Blue, Red and Green	Federal Specification No. TT-P-1952D

The fourth paragraph of Section 84-3.02, "Materials," of the Standard Specifications is amended to read:

- The kind of paint to be used (waterborne or acetone-based) shall be determined by the Contractor based on the time of year the paint is applied and local air pollution control regulations.

The first paragraph of Section 84-3.05, "Application," of the Standard Specifications is amended to read:

Traffic stripes and pavement markings shall be applied only on dry surfaces and only during periods of favorable weather. Painting shall not be performed when the atmospheric temperature is below 5°C when using acetone-based paint or below 10°C when using water borne paint; when freshly painted surfaces may become damaged by rain, fog, or condensation; nor when it can be anticipated that the atmospheric temperature will drop below the aforementioned 5°C or 10°C temperatures during the drying period.

The third paragraph of Section 84-3.05, "Application," of the Standard Specifications is deleted.

The tenth paragraph of Section 84-3.05, "Application," of the Standard Specifications is amended to read:

- Paint to be applied in 2 coats shall be applied approximately as follows:

Paint Type	Square Meter Coverage Per Liter	
	First Coat	Second Coat
Waterborne Paint	6	6
Acetone-Based Paint	10	5

SECTION 85: PAVEMENT MARKERS

Issue Date: July 31, 2007

The second through fifth paragraphs in Section 85-1.03, "Sampling, Tolerances and Packaging," of the Standard Specifications are amended to read:

Sampling

- Twenty markers selected at random will constitute a representative sample for each lot of markers.
- The lot size shall not exceed 25 000 markers.

Tolerances

• Three test specimens will be randomly selected from the sample for each test and tested in conformance with these specifications. Should any one of the 3 specimens fail to conform with the requirements in these specifications, 6 additional specimens will be tested. The failure of any one of these 6 specimens shall be cause for rejection of the entire lot or shipment represented by the sample.

- The entire sample of retroreflective pavement markers will be tested for reflectance. The failure of 10 percent or more of the original sampling shall be cause for rejection.

Section 85-1.04, "Non-Reflective Pavement Markers," of the Standard Specifications is amended to read:

85-1.04 Non-Reflective Pavement Markers

- Non-reflective pavement markers (Types A and AY) shall be, at the option of the Contractor, either ceramic or plastic conforming to these specifications.
- The top surface of the marker shall be convex with a gradual change in curvature. The top, bottom and sides shall be free of objectionable marks or discoloration that will affect adhesion or appearance.
- The bottom of markers shall have areas of integrally formed protrusions or indentations, which will increase the effective bonding surface area of adhesive. The bottom surface of the marker shall not deviate more than 1.5 mm from a flat surface. The areas of protrusion shall have faces parallel to the bottom of the marker and shall project approximately one mm from the bottom.

The second through fourth paragraphs of Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications are deleted.

The table in the fifth paragraph in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications is amended to read:

Testing

- Tests shall be performed in conformance with the requirements in California Test 669.

Test	Test Description	Requirement
a	Bond strength	4.8 MPa, min.
b	Glaze thickness	180 μm, min.
c	Hardness	6 Moh, min.
d	Luminance factor, Type A, white markers only, glazed surface	75, min.
e	Yellowness index, Type A, white markers only, glazed surface	7, max.
f	Color-yellow, Type AY, yellow markers only. The chromaticity coordinates shall be within a color box defined in CTM 669	Pass
g	Compressive strength	6700 N, min.
h	Water absorption	2.0 %, max.
i	Artificial weathering, 500 hours exposure, yellowness index	20, max.

Section 85-1.04B, "Non-Reflective Pavement Markers (Plastic)," of the Standard Specifications is amended to read:

85-1.04B Non-Reflective Pavement Markers (Plastic)

- Plastic non-reflective pavement markers Types A and AY shall be, at the option of the Contractor, either polypropylene or acrylonitrile-butadiene-styrene (ABS) plastic type.
- Plastic markers shall conform to the testing requirements specified in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," except that Tests a, b, c, and h shall not apply. The plastic markers shall not be coated with substances that interfere with the ability of the adhesive bonding to the marker.

The sixth and seventh paragraphs in Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications are amended to read:

Testing

- Tests shall be performed in conformance with the requirements in California Test 669.

Test Description	Requirement		
Bond strength ^a	3.4 MPa, min.		
Compressive strength ^b	8900 N, min.		
Abrasion resistance, marker must meet the respective specific intensity minimum requirements after abrasion.	Pass		
Water Soak Resistance	No delamination of the body or lens system of the marker nor loss of reflectance		
Reflectance	Specific Intensity		
	Clear	Yellow	Red
0° Incidence Angle, min.	3.0	1.5	0.75
20° Incidence Angle, min.	1.2	0.60	0.30
After one year field evaluation	0.30	0.15	0.08

- a. Failure of the marker body or filler material prior to reaching 3.4 MPa shall constitute a failing bond strength test.
- b. Deformation of the marker of more than 3 mm at a load of less than 8900 N or delamination of the shell and the filler material of more than 3 mm regardless of the load required to break the marker shall be cause for rejection of the markers as specified in Section 85-1.03, "Sampling, Tolerances and Packaging."

- Pavement markers to be placed in pavement recesses shall conform to the above requirements for retroreflective pavement markers except that the minimum compressive strength requirement shall be 5338 N.

The eighth paragraph of Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications is deleted.

The sixth paragraph in Section 85-1.06, "Placement," of the Standard Specifications is amended to read:

- 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.

The eighth paragraph in Section 85-1.06, "Placement," of the Standard Specifications is amended to read:

- Epoxy adhesive shall not be used to apply non-reflective plastic pavement markers.

The second sentence of the fourteenth paragraph in Section 85-1.06, "Placement," of the Standard Specifications is amended to read:

- 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.

The seventh sentence of the fourteenth paragraph of Section 85-1.06, "Placement," of the Standard Specifications is amended to read:

- Soft rags moistened with mineral spirits conforming to Army Mil-PRF-680A(1) or kerosene may be used, if necessary, to remove adhesive from exposed faces of pavement markers.

SECTION 86: SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

Issue Date: July 31, 2007

The second paragraph of Section 86-1.01, "Description," of the Standard Specifications is amended to read:

- The locations of signals, beacons, standards, lighting fixtures, signs, controls, services and appurtenances shown on the plans are approximate and the exact locations will be approved by the Engineer in the field.

The tenth paragraph of Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems," of the Standard Specifications is amended to read:

- These provisions will not relieve the Contractor in any manner of the Contractor's responsibilities as provided in Section 7-1.12, "Indemnification and Insurance," and Section 7-1.16, "Contractor's Responsibility for the Work and Materials."

The first sentence of the first paragraph of Section 86-2.02, "Removing and Replacing Improvements," of the Standard Specifications is amended to read:

- Improvements such as sidewalks, curbs, gutters, portland cement concrete and hot mix asphalt pavement, underlying material, lawns and plants and any other improvements removed, broken or damaged by the Contractor's operations, shall be replaced or reconstructed with the same kind of material as found on the work or with materials of equal quality.

The first paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Except for concrete for cast-in-drilled-hole concrete pile foundations, portland cement concrete shall conform to Section 90-10, "Minor Concrete."

The fourth paragraph in Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- After each post, standard, and pedestal on structures is in proper position, mortar shall be placed under the base plate as shown on the plans. The exposed portions shall be formed to present a neat appearance. Mortar shall conform to Section 51-1.135, "Mortar," except the mortar shall consist of one part by volume of cementitious material and 3 parts of clean sand and shall contain only sufficient moisture to permit packing. Mortar shall be cured by keeping it damp for 3 days.

The fifth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in Section 49, "Piling," with the following exceptions: 1) Material resulting from drilling holes shall be disposed of in conformance with the provisions in Section 86-2.01, "Excavating and Backfilling," and 2) Concrete filling for cast-in-drilled-hole concrete piles will not be considered as designated by compressive strength.

The seventh paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and anchor bolts shall be held in place by means of rigid top and bottom templates. The bottom template shall be made of steel. The bottom template shall provide proper spacing and alignment of the anchor bolts near their bottom embedded end. The bottom template shall be installed before placing footing concrete. Anchor bolts shall not be installed more than 1:40 from vertical.

Section 86-2.03, "Foundations," of the Standard Specifications is amended by deleting the eighth paragraph.

The twelfth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Plumbing of the standards shall be accomplished by adjusting the leveling nuts before placing the mortar or before the foundation is finished to final grade. Shims or other similar devices shall not be used for plumbing or raking of posts, standards, or pedestals. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made, firm contact shall exist between all bearing surfaces of the anchor bolt nuts, washers, and the base plates.

The first paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- Bolts, nuts and washers, and anchor bolts for use in signal and lighting support structures shall conform to the provisions in Section 55-2, "Materials." Except when bearing-type connections or slipbases are specified, high-strength bolted connections shall conform to the provisions in Section 55-3.14, "Bolted Connections." Welding, nondestructive testing (NDT) of welds, and acceptance and repair criteria for NDT of steel members shall conform to the requirements of AWS D1.1 and the special provisions.

The second paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- On each lighting standard except Type 1, one rectangular corrosion resistant metal identification tag shall be permanently attached above the hand hole, near the base of the standard, using stainless steel rivets. On each signal pole support, two corrosion resistant metal identification tags shall be attached, one above the hand hole near the base of the vertical standard and one on the underside of the signal mast arm near the arm plate. As a minimum, the information on each identification tag shall include the name of the manufacturer, the date of manufacture, the identification number as shown on the plans, the contract number, and a unique identification code assigned by the fabricator. This number shall be traceable to a particular contract and the welds on that component, and shall be readable after the support structure is coated and installed. The lettering shall be a minimum of 7 mm high. The information may be either depressed or raised, and shall be legible.

The fourth paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- Ferrous metal parts of standards, with shaft length of 4.6 m and longer, shall conform to the details shown on the plans, the provisions in Section 55-2, "Materials," except as otherwise noted, and the following requirements:

- A. Except as otherwise specified, standards shall be fabricated from sheet steel of weldable grade having a minimum yield strength, after fabrication, of 276 MPa.
- B. Certified test reports which verify conformance to the minimum yield strength requirements shall be submitted to the Engineer. The test reports may be the mill test reports for the as-received steel or, when the as-received steel has a lower yield strength than required, the Contractor shall provide supportive test data which provides assurance that the Contractor's method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. The supportive test data shall include tensile properties of the steel after cold forming for specific heats and thicknesses.
- C. When a single-ply 8-mm thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.
- D. Standards may be fabricated of full-length sheets or shorter sections. Each section shall be fabricated from not more than 2 pieces of sheet steel. Where 2 pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the longitudinal welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of standard.
- E. Butt-welded circumferential joints of tubular sections requiring CJP groove welds shall be made using a metal sleeve backing ring inside each joint. The sleeve shall be 3-mm nominal thickness, or thicker, and manufactured from steel having the same chemical composition as the steel in the tubular sections to be joined. When the sections to be joined have different specified minimum yield strengths, the steel in the sleeve shall have the same chemical composition as the tubular section having the higher minimum yield strength. The width of the metal sleeve shall be consistent with the type of NDT chosen and shall be a minimum width of 25 mm. The sleeve shall be centered at the joint and be in contact with the tubular section at the point of the weld at time of fit-up.
- F. Welds shall be continuous.
- G. The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint.
- H. During fabrication, longitudinal seams on vertical tubular members of cantilevered support structures shall 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, shall be within +/-45 degrees of the bottom of the arm.
- I. The longitudinal seam welds in steel tubular sections may be made by the electric resistance welding process.
- J. Longitudinal seam welds shall have 60 percent minimum penetration, except that within 150 mm of circumferential welds, longitudinal seam welds shall be CJP groove welds. In addition, longitudinal seam welds on lighting support 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 150 mm.
- K. Exposed circumferential welds, except fillet and fatigue-resistant welds, shall be ground flush (-0, +2 mm) with the base metal prior to galvanizing or painting.
- L. Circumferential welds and base plate-to-pole welds may be repaired only one time without written permission from the Engineer.

- M. Exposed edges of the plates that make up the base assembly shall be finished smooth and exposed corners of the plates shall be broken unless otherwise shown on the plans. Shafts shall be provided with slip-fitter shaft caps.
- N. Flatness of surfaces of 1) base plates that are to come in contact with concrete, grout, or washers and leveling nuts; 2) plates in high-strength bolted connections; 3) plates in joints where cap screws are used to secure luminaire and signal arms; and 4) plates used for breakaway slip base assemblies shall conform to the requirements in ASTM A6.
- O. Standards shall be straight, with a permissive variation not to exceed 25 mm measured at the midpoint of a 9-m or 11-m standard and not to exceed 20 mm measured at the midpoint of a 5-m through 6-m standard. Variation shall not exceed 25 mm at a point 4.5 m above the base plate for Type 35 and Type 36 standards.
- P. Zinc-coated nuts used on fastener assemblies having a specified preload (obtained by specifying a prescribed tension, torque value, or degree of turn) shall be provided with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the zinc coating on the nut so that the presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.
- Q. No holes shall be made in structural members unless the holes are shown on the plans or are approved in writing by the Engineer.
- R. Standards with an outside diameter of 300 mm or less shall be round. Standards with an outside diameter greater than 300 mm shall be round or multisided. Multisided standards shall have a minimum of 12 sides which shall be convex and shall have a minimum bend radius of 100 mm.
- S. Mast arms for standards shall be fabricated from material as specified for standards, and shall conform to the dimensions shown on the plans.
- T. The cast steel option for slip bases shall be fabricated from material conforming to the requirements in ASTM Designation: A 27/A 27M, Grade 70-40. Other comparable material may be used if written permission is given by the Engineer. The casting tolerances shall be in conformance with the Steel Founder's Society of America recommendations (green sand molding).
- U. One casting from each lot of 50 castings or less shall be subject to radiographic inspection, in conformance with the requirements in ASTM Designation: E 94. The castings shall comply with the acceptance criteria severity level 3 or better for the types and categories of discontinuities in conformance with the requirements in ASTM Designations: E 186 and E 446. If the one casting fails to pass the inspection, 2 additional castings shall be radiographed. Both of these castings shall pass the inspection, or the entire lot of 50 will be rejected.
- V. Material certifications, consisting of physical and chemical properties, and radiographic films of the castings shall be filed at the manufacturer's office. These certifications and films shall be available for inspection upon request.
- W. High-strength bolts, nuts, and flat washers used to connect slip base plates shall conform to the requirements in ASTM Designation: A 325 or A 325M and shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."
- X. Plate washers shall be fabricated by saw cutting and drilling steel plate conforming to the requirements in AISI Designation: 1018, and be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." Prior to galvanizing, burrs and sharp edges shall be removed and holes shall be chamfered sufficiently on each side to allow the bolt head to make full contact with the washer without tension on the bolt.
- Y. High-strength cap screws shown on the plans for attaching arms to standards shall conform to the requirements in ASTM Designation: A 325, A 325M, or A 449, and shall comply with the mechanical requirements in ASTM Designation: A 325 or A 325M after galvanizing. The cap screws shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." The threads of the cap screws shall be coated with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the color of the zinc coating on the cap screw so that presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.
- Z. Unless otherwise specified, bolted connections attaching signal or luminaire arms to poles shall be considered slip critical. Galvanized faying surfaces on plates on luminaire and signal arms and matching plate surfaces on poles shall be roughened by hand using a wire brush prior to assembly and shall conform to the 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) of the Engineering Foundation. For faying surfaces required to be painted, the paint shall be an approved type, brand, and thickness that has been tested and approved according to the RCSC Specification as a Class B coating.
- AA. Samples of fastener components will be randomly taken from each production lot by the Engineer and submitted, along with test reports required by appropriate ASTM fastener specifications, for QA testing and evaluation. Sample sizes for each fastener component shall be as determined by the Engineer.

The seventh paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- To avoid interference of arm plate-to-tube welds with cap screw heads, and to ensure cap screw heads can be turned using conventional installation tools, fabricators shall make necessary adjustments to details prior to fabrication and properly locate the position of arm tubes on arm plates during fabrication.

The fourth subparagraph of the eighteenth paragraph in Section 86-2.05C, "Installation," of the Standard Specifications is amended to read:

- The conduit shall be placed in the bottom of the trench, and the trench shall be backfilled with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete." Minor concrete shall contain not less than 350 kilograms of cementitious material per cubic meter. Concrete backfill shall be placed to the pavement surface except, when the trench is in hot mix asphalt pavement and additional pavement is not being placed, the top 30 mm of the trench shall be backfilled with hot mix asphalt produced from commercial quality paving asphalt and aggregates.

The fifth subparagraph of the eighteenth paragraph in Section 86-2.05C, "Installation," of the Standard Specifications is amended to read:

- Prior to spreading hot mix asphalt, tack coat shall be applied in conformance with the provisions in Section 39, "Hot Mix Asphalt." Spreading and compacting of hot mix asphalt shall be performed by any method which will produce a hot mix asphalt surfacing of uniform smoothness, texture and density.

The third subparagraph of the twenty-third paragraph in Section 86-2.05C, "Installation," of the Standard Specifications is amended to read:

- Precast concrete conduit cradles shall conform to the dimensions shown on the plans and shall be constructed of minor concrete and commercial quality welded wire fabric. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," and shall contain not less than 350 kilograms of cementitious material per cubic meter. The cradles shall be moist cured for not less than 3 days.

The seventh subparagraph of the twenty-third paragraph in Section 86-2.05C, "Installation," of the Standard Specifications is amended to read:

- The space around conduits through bridge abutment walls shall be filled with mortar conforming to the provisions in Section 51-1.135, "Mortar," except that the proportion of cementitious material to sand shall be 1:3.

The fifth paragraph in Section 86-2.07, "Traffic Pull Boxes," of the Standard Specifications is amended to read:

- Concrete placed around and under traffic pull boxes as shown on the plans shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete."

The traffic signal controller cabinet requirement in the table in Section 86-2.08A, "Conductor Identification," of the Standard Specifications is amended to read:

Traffic Signal Controller Cabinet	Ungrounded Circuit Conductor	Blk	None	CON-1	6
	Grounded Circuit Conductor	Wht	None	CON-2	6

The second paragraph of Section 86-2.08B, "Multiple Circuit Conductors," of the Standard Specifications is amended to read by the following 2 paragraphs:

- At any point, the minimum insulation thickness of any Type USE, RHH, or RHW insulation shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive; and 1.3 mm for No. 8 to No. 2, inclusive.
- At any point, the minimum insulation thickness of any Type THW or TW wires shall be 0.7 mm for conductor sizes No. 14 to No. 10, inclusive; 1.0 mm for No. 8; and 1.4 mm for No. 6 to No. 2, inclusive.

The sixth and seventh paragraphs of 86-2.12, "Wood Poles," of the Standard Specifications are amended to read:

- After fabrication, wood poles shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPAs Use Category System: UC4B, Commodity Specification D.

- Wood poles, when specified in the special provisions to be painted, shall be treated with waterborne wood preservatives.

The first paragraph of Section 86-2.15, "Galvanizing," of the Standard Specifications is amended to read:

- Galvanizing shall be in conformance with the provisions in Section 75-1.05, "Galvanizing," except that cabinets may be constructed of material galvanized prior to fabrication in conformance with the requirements in ASTM Designation: A 653/653M, Coating Designation G 90, in which case all cut or damaged edges shall be painted with at least 2 applications of approved unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint." Aerosol cans shall not be used. Other types of protective coating must be approved by the Engineer prior to installation.

Item B of the thirteenth paragraph of Section 86-2.16, "Painting," of the Standard Specifications is amended to read:

- B. Salt Spray Resistance - The undercutting of the film of the coating system shall not exceed 3 mm average, from lines scored diagonally and deep enough to expose the base metal, after 336 hours exposure in a salt spray cabinet in conformance with the requirements in ASTM Designation: B 117.

The first paragraph of Section 86-4.01, "Vehicle Signal Faces," of the Standard Specifications is amended to read:

- Each vehicle signal face shall be of the adjustable type conforming to the requirements in Institute of Transportation Engineers (ITE) Publication: ST-017B, "Vehicle Traffic Control Signal Heads."

Subparagraphs 1 and 3 of the first paragraph of Section 86-4.01A, "Optical Units," of the Standard Specifications are amended to read:

- Lenses, reflectors, reflector assemblies, lamp receptacles, lamps, wiring and light distribution shall conform to the requirements in ITE Publication: ST-017B.
- All reflectors shall conform to the requirements in ITE Publication: ST-017B except that reflectors shall be made of silvered glass or of specular aluminum with an anodic coating. Reflector ring holder shall be made of cast aluminum.

The first paragraph of Section 86-4.01B, "Signal Sections," of the Standard Specifications is amended to read:

- Each signal section housing shall be either die-cast or permanent mold-cast aluminum conforming to ITE Publication: ST-017B or, when specified in the special provisions, shall be structural plastic.

The first paragraph of Section 86-4.01C, "Electrical Components," of the Standard Specifications is amended to read:

- Lamp receptacles and wiring shall conform to ITE Publication: ST-017B. The metal portion of the medium base lamp socket shall be brass, copper or phosphor bronze.

The first paragraph of Section 86-4.01D, "Visors," of the Standard Specifications is amended to read:

- Each signal section shall be provided with a removable visor conforming to the requirements in ITE Publication: ST-017B. Visors are classified, on the basis of lens enclosure, as full circle, tunnel (bottom open), or cap (bottom and lower sides open). Unless otherwise specified, visors shall be the tunnel type.

The first paragraph of Section 86-4.02A, "Physical and Mechanical Requirements," of the Standard Specifications is amended to read:

- Light emitting diode signal modules shall be designed as retrofit replacements for optical units of standard traffic signal sections and shall not require special tools for installation. Light emitting diode signal modules shall fit into existing traffic signal section housings built in conformance with the requirements in the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTCSH)" without modification to the housing.

The seventh paragraph of Section 86-4.02A, "Physical and Mechanical Requirements," of the Standard Specifications is amended to read:

- Light emitting diode signal modules shall be protected against dust and moisture intrusion in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures to protect the internal components.

The first paragraph of Section 86-4.02B, "Photometric Requirements," of the Standard Specifications is amended to read:

- The minimum initial luminous intensity values for light emitting diode signal modules shall conform to the requirements in Section 11.04 of the Institute of Transportation Engineers (ITE) publication ST-017B, "Vehicle Traffic Control Signal Heads (VTCSH)" at 25°C.

The third paragraph of Section 86-4.02C, "Electrical," of the Standard Specifications is amended to read:

- The light emitting diode signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as specified in Section 2.1.6 of NEMA Standard TS2.

Subparagraph 7 of the fourth paragraph of Section 86-4.02D(1), "Design Qualification Testing," of the Standard Specifications is amended to read:

- Moisture resistance testing shall be performed on light emitting diode signal modules in conformance with the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

The second paragraph of Section 86-4.05, "Programmed Visibility Vehicle Signal Faces," of the Standard Specifications is amended to read:

- Each programmed visibility signal section shall provide a nominal 300-mm diameter circular or arrow indication. Color and arrow configuration shall conform to the requirements in ITE Publication: ST-017B.

The first paragraph of Section 86-4.06, "Pedestrian Signal Faces," of the Standard Specifications is amended to read:

- Message symbols for pedestrian signal faces shall be white WALKING PERSON and Portland orange UPRAISED HAND conforming to the requirements in the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications" and "California MUTCD." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

Subparagraph 3 of the first paragraph of Section 86-4.06A, "Types," of the Standard Specifications is amended to read:

- Each reflector assembly shall consist of a double reflector or 2 single reflectors. Each reflector shall be made of either aluminum or plastic. Reflectors shall conform to the requirements in Institute of Transportation Engineers Publication: ST-017B, "Vehicle Traffic Control Signal Heads." Plastic reflectors shall consist of molded or vacuum-formed plastic with a vacuum-deposited aluminum reflecting surface. The plastic material shall not distort when the reflector is used with the lamp of the wattage normally furnished with the signal. In addition, the UL nonmechanical loading temperature of the material shall exceed, by at least 10°C, the maximum temperature in the signal section with the lamp "ON" and measured in an ambient air temperature of 25°C in conformance with the requirements in UL Publication UL 746B. Each completed reflector shall, when operated with the appropriate lamp and lens, provide the message brightness specified.

The tenth paragraph of Section 86-4.07, "Light Emitting Diode Pedestrian Signal Face 'Upraised Hand' Module," of the Standard Specifications is amended to read:

- The luminance of the "UPRAISED HAND" symbol shall be 3750 cd/m² minimum. The color of "UPRAISED HAND" shall be Portland orange conforming to the requirements of the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications" and "California MUTCD." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

The second paragraph of Section 86-4.07C, "Electrical," of the Standard Specifications is amended to read:

- On-board circuitry of the light emitting diode pedestrian signal modules shall include voltage surge protection to withstand high-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS2.

The second paragraph of Section 86-4.07D(1), "Design Qualification Testing," of the Standard Specifications is amended to read:

- A quantity of 2 units for each design shall be submitted for Design Qualification Testing. Test units shall be submitted to the Transportation Laboratory, after manufacturer's testing is complete.

Subparagraphs 5 and 7 of the fourth paragraph of Section 86-4.07D(1), "Design Qualification Testing," of the Standard Specifications are amended to read:

- Mechanical vibration testing shall be in conformance with the requirements in Military Specification MIL-STD-883, Test Method 2007, using three 4-minute cycles along each x, y and z axis, at a force of 2.5 Gs, with a frequency sweep from 2 Hz to 120 Hz. The loosening of the lens or of internal components, or other physical damage shall be cause for rejection.
- Moisture resistance testing shall be performed on modules mounted in a standard pedestrian signal housing in conformance to the requirements in NEMA Standard 250 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

The second sentence of the first paragraph of subsection, "Elastomeric Sealant," of Section 86-5.01A(5), "Installation Details," of the Standard Specifications is amended to read:

- Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

The first sentence of the first paragraph of subsection, "Asphatic Emulsion Sealant," of Section 86-5.01A(5), "Installation Details," of the Standard Specifications is amended to read:

- Asphaltic emulsion sealant shall conform to the requirements in State Specification 8040-41A-15 and shall be used only for filling slots in hot mix asphalt pavement.

The third sentence of the first paragraph of subsection, "Hot-Melt Rubberized Asphalt Sealant," of Section 86-5.01A(5), "Installation Details," of the Standard Specifications is amended to read:

- Sealant shall be suitable for use in both hot mix asphalt and portland cement concrete.

The tenth paragraph of subsection, "Hot-Melt Rubberized Asphalt Sealant," of Section 86-5.01A(5), "Installation Details," of the Standard Specifications is amended to read:

- If hot mix asphalt surfacing is to be placed, the loop conductors shall be installed prior to placing the uppermost layer of hot mix asphalt. The conductors shall be installed, as shown on the plans, in the compacted layer of hot mix asphalt immediately below the uppermost layer. Installation details shall be as shown on the plans, except the sealant shall fill the slot flush to the surface.

The cone penetration, flow, and resilience requirements in the table in the second paragraph under "Hot-Melt Rubberized Asphalt Sealant" of Section 86-5.01A(5), "Installation Details," of the Standard Specifications is amended to read:

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.

The first paragraph in Section 86-5.01D, "Removing or Abandoning Existing Pressure-Sensitive Detectors," of the Standard Specifications is amended to read:

- When a foundation for a pressure-sensitive vehicle detector is to be removed, the hole left by removing the detector frame and foundation shall be filled with minor concrete, except the roadway surface shall be reconstructed with material to match existing surfacing. Minor concrete shall conform to the provisions in Section 90-10, "Minor Concrete," except that the concrete shall contain not less than 250 kilograms of cementitious material per cubic meter for hot mix asphalt surfaced roadways and not less than 350 kilograms of cementitious material per cubic meter for portland cement concrete surfaced roadways.

The third paragraph under "Mounting Assemblies" of Section 86-6.065, "Internally Illuminated Street Name Signs," of the Standard Specifications is amended to read:

- At least 4.9 m of clearance shall be provided between the bottom of the fixture and the roadway.

The first paragraph of Section 86-8.01, "Payment," of the Standard Specifications is amended to read:

• 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 meter price paid for conduit of the various sizes, types and installation methods 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 furnishing and installing, modifying, or removing the systems, combinations or units thereof, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer, including any necessary pull boxes (except when the type required is shown as a separate contract item); excavation and backfill; concrete foundations (except when 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.

Section 86-8.01, "Payment," of the Standard Specifications is amended by adding the following paragraph after the first paragraph:

• If a portion or all of the poles for signal, lighting and electrical systems pursuant to Standard Specification Section 86, "Signals, Lighting and Electrical Systems," is fabricated more than 480 air line kilometers 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 such items from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$5000; in addition, in the case where a fabrication site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced an additional \$3000 per each fabrication site (\$8000 total per site).

SECTION 88: ENGINEERING FABRIC

Issue Date: January 15, 2002

Section 88-1.02, "Pavement Reinforcing Fabric," of the Standard Specifications is amended to read:

• Pavement reinforcing fabric shall be 100 percent polypropylene staple fiber fabric material, needle-punched, thermally bonded on one side, and conform to the following:

Specification	Requirement
Weight, grams per square meter ASTM Designation: D 5261	140
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632	0.45
Elongation at break, percent min. ASTM Designation: D 4632	50
Asphalt retention by fabric, grams per square meter. (Residual Minimum) ASTM Designation: D 6140	900

Note: Weight, grab, elongation and asphalt retention are based on Minimum Average Roll Value (MARV)

SECTION 90: PORTLAND CEMENT CONCRETE

Issue Date: March 16, 2007

Section 90, "Portland Cement Concrete," of the Standard Specifications is amended to read:

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.
- Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.
- Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.
- Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.
- Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.
- Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter 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 meter of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (kg/m ³)
Concrete designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min., 475 max.
Roof sections of exposed top box culverts	400 min., 475 max.
Other portions of structures	350 min., 475 max.
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min.
Roof sections of exposed top box culverts	400 min.
Prestressed members	400 min.
Seal courses	400 min.
Other portions of structures	350 min.
Concrete for precast members	350 min., 550 max.

- Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be designated by compressive strength. If the plans show a 28-day compressive strength that is 28 MPa or greater, an additional 14 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans that are 25 MPa or less are shown for design information only and are not a requirement for acceptance of the concrete.
- Concrete designated by compressive strength shall be proportioned such that the concrete will attain the strength shown on the plans or specified in the special provisions.
- Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those 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 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 supplementary cementitious material 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 \$0.55 for each kilogram of cementitious material, portland cement, or supplementary cementitious material 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 or commercial quality 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 a supplementary cementitious material, or a blended cement.
- 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 cementitious materials meeting this Section 90-2.01 are kept separate from other 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.

90-2.01A CEMENT

- Portland cement shall conform to the requirements in ASTM Designation: C 150 except, using a 10-sample moving average, limestone shall not exceed 2.5 percent. 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 and shall be comprised of an intimate and uniform blend of Type II or Type V cement and supplementary cementitious material in an amount conforming to the requirements in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials."
- In addition, blended cement, 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 alkalis, 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;
 - B. The autoclave expansion shall not exceed 0.50-percent; and
 - C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not expand in water more than 0.010-percent and shall not contract in air more than 0.048-percent, except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053-percent.
- Type III portland cement shall be used only as specified in the special provisions or with the approval of the Engineer. Type III portland cement shall conform to the additional requirements listed above for Type II portland cement, except when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075-percent.

90-2.01B SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCM)

- Fly ash shall conform to the requirements in AASHTO Designation: M 295, Class F, and the following:
 - A. Calcium oxide content shall not exceed 10 percent.
 - B. 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.
 - C. Commingling of fly ash from different sources at uncontrolled ratios is permissible only if the following criteria are satisfied:

1. Sources of fly ash to be commingled shall be on the approved list of materials for use in concrete.
 2. Testing of the commingled product is the responsibility of the fly ash supplier.
 3. Each fly ash's running average of density shall not differ from any other by more than 0.25g/cm³ at the time of commingling.
 4. 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.
 5. The final product of commingled fly ash shall conform to the requirement in AASHTO Designation: M 295.
- Raw or calcined natural pozzolans shall conform to the requirements in AASHTO Designation: M 295, Class N and the following requirements:
 - A. Calcium oxide content shall not exceed 10 percent.
 - B. 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.
 - Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the requirements in AASHTO Designation: M 302, Grade 100 or Grade 120.
 - Silica Fume shall conform 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.

90-2.01C REQUIRED USE OF SUPPLEMENTARY CEMENTITIOUS MATERIALS

- 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 the following:
 - A. If a blended cement conforming to the provisions in Section 90-2.01A, "Cement," is used, the minimum amount of SCM incorporated into the cement shall conform to the provisions in this Section 90-2.01C.
 - B. Fly ash or natural pozzolan, silica fume, or GGBFS shall not be used with Type IP or Type IS cements.
- Use of SCMs shall conform to the following:
 - A. If fly ash or natural pozzolan is used:
 1. The minimum amount of portland cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
 2. The minimum amount of fly ash or natural pozzolan shall be:
 - a. Fifteen percent by mass of the total amount of cementitious material if the calcium oxide content of fly ash or natural pozzolan is equal to or less than 2 percent by mass;
 - b. Twenty-five percent by mass of the total amount of cementitious material if the calcium oxide content of fly ash or natural pozzolan is greater than 2 percent by mass.
 - B. The total amount of fly ash or natural pozzolan shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. If Section 90-1.01, "Description," specifies a maximum cementitious material content in kilograms per cubic meter, the total mass of portland cement and fly ash or natural pozzolan per cubic meter shall not exceed the specified maximum cementitious material content.
 - C. If silica fume is used:
 1. The amount of silica fume shall not be less than 10 percent by mass of the total amount of cementitious material.
 2. The amount of portland cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
 3. If Section 90-1.01, "Description," specifies a maximum cementitious material content in kilograms per cubic meter, the total mass of portland cement and silica fume per cubic meter shall not exceed the specified maximum cementitious material content.

D. If GGBFS is used:

1. The minimum amount of GGBFS shall be either:
 - a. Forty percent of the total cementitious material to be used, if the aggregates used in the concrete are on the Department's list of "Approved Aggregates For Use in Concrete with Reduced Fly Ash."
 - b. No less than 50 percent.
2. The amount of GGBFS shall not exceed 60 percent by mass of the total amount of cementitious materials to be used.

90-2.02 AGGREGATES

- 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 \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter 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 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 \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter 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 250 m³ 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:

- 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
- 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
Mortar Strengths Relative to Ottawa Sand	515	95%, min.
Sand Equivalent:		
Operating Range	217	75, min.
Contract Compliance	217	71, min.

a Fine aggregate developing a color darker than the reference standard color solution may be accepted if it is determined by the Engineer, from mortar strength tests, that a darker color is acceptable.

- 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:

- 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
- 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 1000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO₄, 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 1300 parts per million of sulfates as SO₄, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 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, when compared to the results obtained with distilled water or deionized water, 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 2000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1500 parts per million of sulfates as SO₄, 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 (Na₂O + 0.658 K₂O) 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 conform to the requirements in the following ASTM Designations:
 - A. Chemical Admixtures—ASTM Designation: C 494.
 - B. Air-entraining Admixtures—ASTM Designation: C 260.

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
37.5-mm x 19-mm	25-mm	19 - 41
25-mm x 4.75-mm	19-mm	52 - 85
25-mm x 4.75-mm	9.5-mm	15 - 38
12.5-mm x 4.75-mm	9.5-mm	40 - 78
9.5-mm x 2.36-mm	9.5-mm	50 - 85
Fine Aggregate	1.18-mm	55 - 75
Fine Aggregate	600-µm	34 - 46
Fine Aggregate	300-µm	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:

Sieve Sizes	Percentage Passing Primary Aggregate Nominal Sizes							
	37.5-mm x 19-mm		25-mm x 4.75-mm		12.5-mm x 4.75-mm		9.5-mm x 2.36-mm	
	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance
50-mm	100	100	—	—	—	—	—	—
37.5-mm	88 - 100	85 - 100	100	100	—	—	—	—
25-mm	X ±18	X ±25	88 - 100	86 - 100	—	—	—	—
19-mm	0 - 17	0 - 20	X ±15	X ±22	100	100	—	—
12.5-mm	—	—	—	—	82 - 100	80 - 100	100	100
9.5-mm	0 - 7	0 - 9	X ±15	X ±22	X ±15	X ±22	X ±15	X ±20
4.75-mm	—	—	0 - 16	0 - 18	0 - 15	0 - 18	0 - 25	0 - 28
2.36-mm	—	—	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 37.5-mm, 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 25-mm, 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 25-mm x 4.75-mm 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
9.5-mm	100	100
4.75-mm	95 - 100	93 - 100
2.36-mm	65 - 95	61 - 99
1.18-mm	X ±10	X ±13
600-µm	X ±9	X ±12
300-µm	X ±6	X ±9
150-µm	2 - 12	1 - 15
75-µm	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 1.18-mm sieve and the total percentage passing the 600-µm sieve shall be between 10 and 40, and the difference between the percentage passing the 600-µm and 300-µm 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 37.5-mm, maximum grading, or the 25-mm, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

Sieve Sizes	Percentage Passing			
	37.5-mm Max.	25-mm Max.	12.5-mm Max.	9.5-mm Max.
50-mm	100	—	—	—
37.5-mm	90 - 100	100	—	—
25-mm	50 - 86	90 - 100	—	—
19-mm	45 - 75	55 - 100	100	—
12.5-mm	—	—	90-100	100
9.5-mm	38 - 55	45 - 75	55 - 86	50 - 100
4.75-mm	30 - 45	35 - 60	45 - 63	45 - 63
2.36-mm	23 - 38	27 - 45	35 - 49	35 - 49
1.18-mm	17 - 33	20 - 35	25 - 37	25 - 37
600-µm	10 - 22	12 - 25	15 - 25	15 - 25
300-µm	4 - 10	5 - 15	5 - 15	5 - 15
150-µm	1 - 6	1 - 8	1 - 8	1 - 8
75-µm	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 mass 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.

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.
- Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory a sample of the admixture accompanied by certified test results demonstrating that the admixture complies with the requirements in the appropriate ASTM Designation and these specifications. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the requirements, based on the certified test results submitted, together with tests the Department may elect to perform.
- 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 mass, except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter; and
- B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

- 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 required for concrete pavement, 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 2.5 L/m³ 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, "Proportioning for Pavement." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and supplementary cementitious material for one batch of concrete is a single operation of a switch or starter.

- 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 mass of each batch of material shall not vary from the mass 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 mass 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 mass designated for each size of aggregate. Equipment for cumulative weighing of cement and supplementary cementitious material shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the cement and supplementary cementitious material. Equipment for weighing cement or supplementary cementitious material separately shall have a zero tolerance of ± 0.5 percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

- The mass 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 mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses; and
- B. Cement shall be 99 to 102 percent of its designated batch mass. When weighed individually, supplementary cementitious material shall be 99 to 102 percent of its designated batch mass. When supplementary cementitious material and cement are permitted to be weighed cumulatively, cement shall be weighed first to 99 to 102 percent of its designated batch mass, and the total for cement and supplementary cementitious material shall be 99 to 102 percent of the sum of their designated batch masses; and
- C. Water shall be within 1.5 percent of its designated mass or volume.

- Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, supplementary cementitious material, or cement plus supplementary cementitious material and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5-kg 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 mass.

- 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 mass.

- 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) 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 supplementary cementitious material 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 supplementary cementitious material are weighed cumulatively, the cement shall be weighed first.

- If cement and supplementary cementitious material are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the supplementary cementitious material 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 supplementary cementitious material shall be discharged into the mixer simultaneously with the aggregate.

- The scales and weigh hoppers for bulk weighing cement, supplementary cementitious material, or cement plus supplementary cementitious material shall be separate and distinct from the aggregate weighing equipment.

- For batches of one cubic meter 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 masses, the gross mass and tare mass 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 PROPORTIONING FOR PAVEMENT

- Aggregates and bulk supplementary cementitious material for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to these specifications.

- 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 mass of the fine aggregate.

- The batching of cement, supplementary cementitious material, or cement plus supplementary cementitious material 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 supplementary cementitious material hoppers or the cement plus supplementary cementitious material hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

- If interlocks are required for cement and supplementary cementitious material charging mechanisms and cement and supplementary cementitious material are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass 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 paving mixers, the supplementary cementitious materials shall be weighed in a separate weigh hopper and the supplementary cementitious material 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, supplementary cementitious material, aggregates, and water uniformly before discharge, weighing the supplementary cementitious material 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 paving 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 paving 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 supplementary cementitious material hoppers or the cement plus supplementary cementitious material hopper shall be designed to permit regulating the flow of cement, supplementary cementitious material, or cement plus supplementary cementitious material 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 mass 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 0.25-m³ 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 10 mm. 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 100 kg per cubic meter of concrete.

Average Slump	Maximum Permissible Difference
Less than 100-mm	25-mm
100-mm to 150-mm	38-mm
Greater than 150-mm to 225-mm	50-mm

- 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 10°C or more than 32°C. 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 65°C. 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.

- 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.

- Paving and 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:

- 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).
- Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
- Mixed completely in a truck mixer (transit-mixed concrete).
- Mixed completely in a paving mixer.

- 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 nonagitating 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 24°C.
- No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.
- The rate of discharge of mixed concrete from truck mixer-agitators 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 cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or if the temperature of the concrete is 30°C 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 30°C, 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 cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement 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 masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.
- 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 90 mm diskette with a capacity of at least 1.4 megabytes. 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 masses 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 job site 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 paving or 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 paving or 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 paving or 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 0.25-m³ 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 0.3-meters 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 225 mm after the chemical admixtures are added.

Type of Work	Nominal		Maximum	
	Penetration (mm)	Slump (mm)	Penetration (mm)	Slump (mm)
Concrete Pavement	0 - 25	—	40	—
Non-reinforced concrete facilities	0 - 35	—	50	—
Reinforced concrete structures				
Sections over 300-mm thick	0 - 35	—	65	—
Sections 300-mm thick or less	0 - 50	—	75	—
Concrete placed under water	—	150 - 200	—	225
Cast-in-place concrete piles	65 - 90	130 - 180	100	200

- The amount of free water used in concrete shall not exceed 183 kg/m³, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m³.

- 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 meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. 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 100 μm , and shall be extruded onto 283.5-gram 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 250 μm 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 75 mm 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 60°C, 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 0.15-kg/m² 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 3.7 m²/L, unless otherwise specified.
 - At any point, the application rate shall be within ± 1.2 m²/L of the nominal rate specified, and the average application rate shall be within ± 0.5 m²/L 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 4°C and shall not be diluted or altered after manufacture.
 - The curing compound shall be packaged in clean 1040-L totes, 210-L barrels, or 19-L pails, or shall be supplied from a suitable storage tank located at the job site. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 1040-L totes and the 210-L barrels shall have removable lids and airtight fasteners. The 19-L 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 100 mm.
 - 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 0.5-m 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 CURING PAVEMENT

- The entire exposed area of the pavement, including edges, shall be cured by the waterproof membrane method, or curing compound method using curing compound (1) or (2) as the Contractor may elect. Should the side forms be removed before the expiration of 72 hours following the start of curing, the exposed pavement edges shall also be cured. If the pavement is cured by means of the curing compound method, the sawcut and all portions of the curing compound that have been disturbed by sawing operations shall be restored by spraying with additional curing compound.
- Curing shall commence as soon as the finishing process provided in Section 40-1.10, "Final Finishing," has been completed. The method selected shall conform to the provisions in Section 90-7.01, "Methods of Curing."
- When the curing compound method is used, the compound shall be applied to the entire pavement surface by mechanical sprayers. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator that provides for continual agitation of the curing compound during the time of application. The spray shall be adequately protected against wind, and the nozzles shall be so oriented or moved mechanically transversely as to result in the minimum specified rate of coverage being applied uniformly on exposed faces. Hand spraying of small and irregular areas, and areas inaccessible to mechanical spraying equipment, in the opinion of the Engineer, will be permitted. When the ambient air temperature is above 15°C, the Contractor shall fog the surface of the concrete with a fine spray of water as specified in Section 90-7.01A, "Water Method." The surface of the pavement shall be kept moist between the hours of 10:00 a.m. and 4:30 p.m. on the day the concrete is placed. However, the fogging done after the curing compound has been applied shall not begin until the compound has set sufficiently to prevent displacement. Fogging shall be discontinued if ordered in writing by the Engineer.

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 10°C, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 10°C and 32°C.
 - 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 22°C per hour. The curing temperature throughout the enclosure shall not exceed 65°C 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 60 m 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 15°C 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 7°C for 72 hours after placing and at not less than 4°C for an additional 4 days.

90-8.03 PROTECTING CONCRETE PAVEMENT

- Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours.
- Except as provided in Section 7-1.08, "Public Convenience," the Contractor shall protect concrete pavement against construction and other activities that abrade, scar, discolor, reduce texture depth, lower coefficient of friction, or otherwise damage the surface. Stockpiling, drifting, or excessive spillage of soil, gravel, petroleum products, and concrete or asphalt mixes on the surface of concrete pavement is prohibited unless otherwise specified in these specifications, the special provisions or permitted by the Engineer.
 - If ordered by the Engineer or shown on the plans or specified in the special provisions, pavement crossings shall be constructed for the convenience of public traffic. The material and work necessary for the construction of the crossings, and their subsequent removal and disposal, will be paid for at the contract unit prices for the items of work involved and if there are no contract items for the work involved, payment for pavement crossings will be made by extra work as provided in Section 4-1.03D, "Extra Work.". Where public traffic will be required to cross over the new pavement, Type III portland cement may be used in concrete, if permitted in writing by the Engineer. The pavement may be opened to traffic as soon as the concrete has developed a modulus of rupture of 3.8 MPa. The modulus of rupture will be determined by California Test 523.
 - No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement before a period of 10 days has elapsed after the concrete has been placed, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa. Concrete that fails to attain a modulus of rupture of 3.8 MPa within 10 days shall not be opened to traffic until directed by the Engineer.
 - Equipment for sawing weakened plane joints will be permitted on the pavement as specified in Section 40-1.08B, "Weakened Plane Joints."
 - When requested in writing by the Contractor, the tracks on one side of paving equipment will be permitted on the pavement after a modulus of rupture of 2.4 MPa has been attained, provided that:
 - A. Unit pressure exerted on the pavement by the paver shall not exceed 135 kPa;
 - B. Tracks with cleats, grousers, or similar protuberances shall be modified or shall travel on planks or equivalent protective material, so that the pavement is not damaged; and
 - C. No part of the track shall be closer than 0.3-m from the edge of pavement.
- In case of visible cracking of, or other damage to the pavement, operation of the paving equipment on the pavement shall be immediately discontinued.
 - Damage to the pavement resulting from early use of pavement by the Contractor's equipment as provided above shall be repaired by the Contractor.
 - The State will furnish the molds and machines for testing the concrete for modulus of rupture, and the Contractor, at the Contractor's expense, shall furnish the material and whatever labor the Engineer may require.

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 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 28-day 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 \$14 for each in-place cubic meter 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 \$20 for each in place cubic meter 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 curing 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 curing 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 and quality of the concrete placed in the work are acceptable. 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 250 m³.

- 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 is specified by compressive strength, 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 cure 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 4 MPa 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 meters and the mass, 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 or class 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.

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."

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 37.5 mm or smaller than 19 mm.

- 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 authorized 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 nonagitating 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 32°C 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 4°C 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 meters shall be computed as the total mass of the batch in kilograms divided by the density of the concrete in kilograms per cubic meter. The total mass 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

Issue Date: November 18, 2005

Section 91-3, "Paints for Timber," of the Standard Specifications is amended to read:

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."

Section 91-4, "Miscellaneous Paints," of the Standard Specifications is amended to read:

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

Issue Date: February 2, 2007

Section 92, "Asphalts," of the Standard Specifications is amended to read:

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/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
Maximum, Pa·s | T 316 | 3.0 | 3.0 | 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 | 64
1.00 | 64
1.00 | 70
1.00 |
| RTFO Test, ^e
Mass Loss, Maximum, % | T 240 | 1.00 | 1.00 | 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 | 64
2.20 | 64
2.20 | 70
2.20 |
| Ductility at 25°C
Minimum, cm | T 51 | 75 | 75 | 75 | 75 | 75 |
| PAV ^f Aging,
Temperature, °C | R 28 | 100 | 100 | 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 | 22 ^d
5000 | 31 ^d
5000 | 28 ^d
5000 | 22 ^d
5000 | 34 ^d
5000 |
| Creep Stiffness,
Test Temperature, °C
Maximum S-value, Mpa
Minimum M-value | T 313 | -12
300
0.300 | 0
300
0.300 | -6
300
0.300 | -18
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 600 and 750 mm above the platform. Provide a receptacle for flushing the sampling device.
 - Include with the sampling device a valve:

1. Between 10 and 20 mm in diameter
2. Manufactured in a manner that a one-liter 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-liter samples per operating day. Provide round, friction top, one-liter 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 mass, the Department measures asphalt tonnes by complying with the specifications for mass determination of liquid asphalt in Section 93, "Liquid Asphalts."
 - The Engineer determines the asphalt mass 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 35 km 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 asphalt concrete 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 mass, the Engineer reduces the measured volume to that which the asphalt would occupy at 15°C.
 2. The Engineer uses 981 L/tonne and 1020 g/L for the average mass and volume for PG and PG Polymer Modified asphalt grades at 15°C.
 3. The Engineer uses the Conversion Table in Section 93, "Liquid Asphalts."

SECTION 93: LIQUID ASPHALTS

Issue Date: November 3, 2006

The ninth paragraph of Section 93-1.04, "Measurement," of the Standard Specifications is amended to read:

- 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

Issue Date: March 16, 2007

Section 95, "Epoxy," of the Standard Specifications is amended to read:

95-1 GENERAL

95-1.01 DESCRIPTION

- These specifications are intended to specify epoxy that will meet service requirements for highway construction.
- Epoxy shall be furnished as 2 components, which shall be mixed together at the site of the work.

95-1.02 SAMPLING AND TESTING

- Epoxy shall not be used prior to sampling and testing unless its use is permitted prior to sampling and testing in conformance with the provisions in Section 6-1.07, "Certificates of Compliance."
- Tests will be conducted in conformance with the latest test methods of the American Society for Testing and Materials, and California Test Methods in use by the Transportation Laboratory.
- Epoxy components shall be formulated to maintain the specified properties for a minimum of one year. The Engineer may require additional testing of any epoxy component that has not been used within one year of manufacture.

95-1.03 PACKAGING, LABELING AND STORING

- Each component shall be packaged in containers of size proportional to the amount of that component in the mix so that one container of each component is used in mixing one batch of epoxy. The containers shall be of such design that all of the contents may be readily removed and shall be well sealed to prevent leakage. The containers and labeling shall meet U.S. Department of Transportation Hazardous Material Shipping Regulations, and the containers shall be of a material, or lined with a material, of such character as to resist any action by the components. Each container shall be clearly labeled with the ASTM Designation: C881 Class and Type; designation (Component A or B); manufacturer's name; date of manufacture; batch number (a batch shall consist of a single charge of all components in a mixing chamber); all directions for use (as specified elsewhere) and such warning or precautions concerning the contents as may be required by State or Federal Laws and Regulations. The manufacturer of the finished epoxy components shall furnish a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," and a copy of the label for each material. The certificate shall include a list, by Title and Section, of the State and Federal packaging and labeling laws and regulations that the manufacturer has complied with.
- Attention is directed to the characteristic of some epoxy components to crystallize or thicken excessively prior to use when stored at temperatures below 2°C. Any material which shows evidence of crystallization or a permanent increase in viscosity or settling of pigments which cannot be readily redispersed with a paddle shall not be used.

95-1.04 DIRECTIONS FOR USE

- At the time of mixing, components A and B shall be at a temperature between 15°C and 30°C, unless otherwise specified. Any heating of the adhesive components shall be done by application of indirect heat. Immediately prior to mixing, each component shall be thoroughly mixed with a paddle. Separate paddles shall be used to stir each component. Immediately prior to use, the 2 components shall be thoroughly mixed together in the specified ratios. No solvent shall be added to any epoxy.
- After mixing, epoxies shall be placed in the work and any overlaying or inserted material which is to be bonded to the work by the epoxy shall also be placed before thickening of the epoxy has begun. Surfaces upon which epoxy is to be placed shall be free of rust, paint, grease, asphalt, and loose and deleterious material. When epoxy is used as a binder to make epoxy concrete or mortar, the 2 components of epoxy shall be thoroughly mixed together before the aggregate is added and, unless otherwise specified, the mix proportions shall consist of one part of binder to approximately 4 parts of aggregate, by volume. Aggregate for use in epoxy concrete and mortar shall be clean and shall have a moisture content of not more than 0.50-percent when tested by California Test 226. Surfaces against which epoxy concrete and mortar are to be placed shall be primed with a coat of the epoxy used just prior to placing the concrete or mortar.

95-2 TYPES OF EPOXIES

95-2.01 BINDER (ADHESIVE), EPOXY RESIN BASE

Classification:

- This specification covers a low viscosity epoxy formulated primarily for use in making high-strength epoxy concrete and epoxy mortar and in pressure grouting of cracks in concrete. For load bearing applications, use ASTM Designation: C 881, Type IV, Grade 1, Class B or C. Class B or C shall be used depending on the substrate and ambient temperatures. Use Grade B for atmospheric and surface temperatures as low as 4°C. Use Class C when temperatures are 15°C or higher. For non-load bearing applications use ASTM Designation: C881, Type I, Grade 1, Class B or C. Apply no thicker than

recommended by the manufacturer. Thick sections of this epoxy are not suitable for use in freeze thaw environments. In a freeze-thaw environment, increase the aggregate loading to improve the properties of the epoxy concrete.

Directions for Use:

- Mix in conformance with the manufacturer's written recommendations. No more material shall be mixed than can be used within the pot-life from the time mixing operations are started.

95-2.02 (BLANK)

95-2.03 EPOXY RESIN ADHESIVE FOR BONDING NEW CONCRETE TO OLD CONCRETE

Classification:

- This specification covers a low viscosity paste epoxy formulated primarily for use in bonding new portland cement concrete to hardened portland cement concrete. The epoxy shall meet the specification requirements of ASTM Designation: C 881, Type V, Grade 2. This epoxy is available in 2 Classes: Class C for general use at temperature greater than 15°C and Class B for use when cure temperatures are below 15°C and above 4°C, or when a faster cure is required.

Directions for Use:

- The mixing ratio and use shall be in conformance with the manufacturer's written recommendations. When measuring as individual Components A and B, stir and tap the measuring containers to remove possible air voids. The ingredients in Components A and B shall be thoroughly dispersed such that each component forms a uniform paste. Do not mix more material than can be spread within the pot life from the time mixing operations are started. The spreading rate shall be sufficient to thoroughly coat the surface. Spread the mixed adhesive by brush or roller over blast-cleaned concrete at a rate recommended by the manufacturer. The new concrete shall be placed against the adhesive coating on the old concrete before the adhesive has set. If the adhesive has set and is not tacky prior to placing the new concrete, a new coating of adhesive shall be applied.

95-2.04 RAPID SET EPOXY ADHESIVE FOR PAVEMENT MARKERS

Classification:

- This specification covers a high viscosity paste, rapid set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The adhesive shall meet ASTM Designation: C 881, Type IV, Grade 3, Class B and C except that the gel time may be shorter than 30 minutes. The adhesive shall conform to these requirements and the following.

Characteristics of Combined Components:

- All tests shall be performed in conformance with the requirements in California Test 434.

| Property | Requirement |
|------------------------------------------------------------------------------------------------------|-------------|
| Gel time, minutes, maximum, at 25°C | 30 |
| Bond Strength to Concrete, Time, minutes (maximum) to reach not less than 1.4 MPa | |
| at 25°C ±1°C | 35 |
| at 10°C ±1°C | 45 |
| Slant Shear Strength | |
| 2 days at 25°C ±1°C, MPa | 7 |
| 14 days at 25°C ±1°C, plus water soak, MPa | 10.5 |
| Tensile Adhesion and Cohesion | |
| Ceramic marker bottom, MPa | 4.8 min. |
| Ceramic marker bottom, including post cure, MPa | 4.8 min. |
| Retroreflective pavement marker bottom, MPa | 3.4 min. |
| Color of mixed epoxy | gray |
| Glass transition temperature, Tg, samples conditioned at 25°C for 24 hours, ASTM Designation: D 4065 | 30°C min. |

Directions for Use:

- Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

95-2.05 STANDARD SET EPOXY ADHESIVE FOR PAVEMENT MARKERS

Classification:

- This specification covers a high viscosity paste standard set epoxy formulated primarily for use in bonding pavement markers to portland cement concrete and asphalt concrete. The epoxy shall meet ASTM Designation: C 881, Type IV, Viscosity Grade 3, Classes B or C, except that the gel time may be shorter than 30 minutes.

Characteristics of Combined Components:

- All tests shall be performed in conformance with the requirements in California Test 434.

| Property | Requirement |
|------------------------------------------------------------------------------------------------------|-------------|
| Gel time, minutes, maximum, at 25°C | 30 |
| Bond Strength to Concrete, Time (maximum) to reach not less than 1.4 MPa | |
| at 25°C ±1°C | 3.5 hours |
| at 13°C ±1°C | 24 hours |
| Slant Shear Strength | |
| 2 days at 25°C ±1°C, MPa | 7 min. |
| 14 days at 25°C ±1°C, plus water soak, MPa | 10.5 min. |
| Tensile Adhesion and Cohesion | |
| Ceramic marker bottom, MPa | 4.8 min. |
| Ceramic marker bottom, including post cure, MPa | 4.8 min. |
| Reflective pavement marker bottom, MPa | 3.4 min. |
| Color of Mixed Components | gray |
| Glass transition temperature, Tg, samples conditioned at 25°C for 24 hours, ASTM Designation: D 4065 | 30°C min. |

Directions for Use:

- Components A and B shall be mixed in conformance with the manufacturer's written recommendations. When an automatic proportioning and mixing machine is used, the temperature of the components shall be maintained by indirect heating or cooling, so that the adhesive will meter, mix and extrude properly. The maximum temperature shall be such that after proper mixing no excess adhesive shall flow from under the marker other than that specified in Section 85-1.06, "Placement."

95-2.06 (BLANK)

95-2.07 (BLANK)

95-2.08 (BLANK)

95-2.09 EPOXY SEALANT FOR INDUCTIVE LOOPS

Classification:

- This specification covers a high viscosity liquid epoxy formulated primarily for use in sealing inductive wire loops and leads imbedded in asphalt concrete and portland cement concrete for traffic signal controls and vehicle counters. This epoxy is to be used for repair work on existing spalls, cracks and other deformations in and around saw cuts housing inductor loops and leads. The rapid cure allows minimum traffic delay. This sealant is suitable for use in freeze-thaw areas. The epoxy shall meet ASTM Designation: C 881, Type I, Grade 2 and the following requirements.

Characteristics of Combined Components:

- All tests shall be performed in conformance with the requirements in California Test 434.

| Property | Requirement |
|---------------------------------------------------------------|-------------|
| Gel time, minutes, maximum | 30 |
| On 3-mm cast sheet, cured 18 hours at 25°C, + 5 hours at 70°C | |
| Tensile Strength, MPa | 2.7 min. |
| Elongation, percent | 90 min. |
| Shore D Hardness | 45 min. |

Directions for Use:

- Saw cuts shall be cleaned with compressed air to remove all excess moisture and debris. For repairing damaged saw cuts, all loose spalled material shall be cleaned away from the saw cut, chipping back to sound asphalt concrete or portland cement concrete and all loose material cleaned from loop wires.
- The mixing ratio shall be in conformance with the manufacturer's recommendations. No more material shall be mixed than can be used within the gel time from the time mixing operations are started.
- When automatic mixing equipment is used for mixing the sealant, the provisions in the twelfth paragraph in Section 85-1.06, "Placement," shall apply.

95-2.10 (BLANK)

95-2.11 EPOXY RESIN ADHESIVE FOR INJECTION GROUTING OF PORTLAND CEMENT CONCRETE PAVEMENTS

Directions for Use:

- Both components and the mixed material shall contain no solvents. The mixing ratio of the components in terms of volume and mass shall be clearly stated. The material shall be suitable for use in the mixing equipment used by the applicator. Epoxy adhesive samples shall be furnished to the Engineer for testing at least 12 days before the expected time of use.

Characteristics of Adhesive:

| Test ^a | California Test | Requirement |
|-------------------------------------------------------------------------------------|------------------------------------------------------------|-------------|
| Brookfield Viscosity, No. 3 Spindle at 20 rpm, Pa·s at 25°C | 434, Part 4 | 0.9 max. |
| Gel time, minutes | 434, Part 1 | 2 to 15 |
| Slant Shear Strength on Dry Concrete, MPa, after 4 days of cure in air at 25°C ±1°C | 434, Part 5 ^b | 41.4 min. |
| Slant Shear Strength on Wet Concrete, MPa, after 4 days of cure in air at 25°C ±1°C | 434, Part 5 ^b | 21.1 min. |
| Tensile Strength, Mpa | 434, Part 7, except test after 4 days of cure at 25°C ±1°C | 31.0 min. |
| Elongation, % | 434, Part 7, except test after 4 days of cure at 25°C ±1°C | 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 25°C ±1°C. Remove and wipe off excess water.

2 Mix epoxy as described in California Test 434, Part 1, and apply a coat approximately 250 µm thick to each diagonal surface. Place four 3-mm square pieces of shim stock 305 µm 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.

END OF AMENDMENTS

SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS

2-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the proposal form and the submission of the bid.

The bidder shall complete the "List of Subcontractors" form in the Proposal and Contract book, listing the name, address, and portion of work to be performed by each subcontractor listed. In addition to the subcontractors required to be listed in conformance with Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications, the bidder shall list on this form each first tier Disabled Veteran Business Enterprise subcontractor to be used for credit in meeting the goal. A first tier subcontractor is one to whom the bidder proposes to directly subcontract portions of the work.

The Bidder's Bond form mentioned in the last paragraph in Section 2-1.07, "Proposal Guaranty," of the Standard Specifications will be found following the signature page of the Proposal.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

Failure of the bidder to fulfill the requirements of the Special Provisions for submittals required to be furnished after bid opening, (including but not limited to DVBE submittals, and escrowed bid documents or prequalification materials when required), may subject the bidder to a determination of the bidder's responsibility in the event it is the apparent low bidder on any subsequent public works contracts.

2-1.02 DISABLED VETERAN BUSINESS ENTERPRISE (DVBE)

It is the policy of the Department that Disabled Veteran Business Enterprises (DVBEs) shall be provided the opportunity for full participation in the performance of contracts financed solely with state funds. The Contractor shall take all necessary and reasonable steps to ensure that DVBEs have such opportunity to participate in the performance of this contract. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of subcontracts.

It is the bidder's responsibility to make a sufficient portion of the work available to subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DVBE subcontractors and suppliers, so as to assure meeting the goal for DVBE participation or to provide information to establish that, prior to bidding, the bidder made good faith efforts to do so.

Section 999, et seq., of the Military and Veterans Code sets forth requirements for DVBE participation goals, summarized as follows:

- A. "Disabled Veteran Business Enterprise" (DVBE) means a business concern certified as a DVBE by the Office of Small Business and DVBE Services, Department of General Services.
- B. DVBEs must be certified on the date bids for the project are opened before credit may be allowed toward the DVBE goal. It is the Contractor's responsibility to verify that DVBEs are certified.
- C. The disabled veteran business owner must be domiciled in the State of California.
- D. A DVBE may participate as a prime contractor, as a subcontractor, as a joint venture partner with a prime or subcontractor, or as a vendor of material or supplies.
- E. The DVBE must perform a commercially useful function, that is, be responsible for the execution of a distinct element of the work and carry out its responsibility by actually performing, managing, or supervising the work. An extra participant will not be considered to perform a commercially useful function.
- F. Credit for DVBE prime contractors will be 100 percent of the contract price.
- G. Credit for participation of a DVBE subcontractor, supplier, or broker will be 100 percent provided such DVBE is performing a commercially useful function.
- H. A DVBE broker shall submit the required declarations and federal tax returns at the time of performance.

Failure to carry out the requirements of Section 999, et seq., of the Military and Veterans Code shall constitute a material breach of this contract and may result in termination of the contract or other remedy the Department deems appropriate.

A DVBE joint venture partner must be responsible for specific contract items of work, or portions thereof. The DVBE joint venture partner must share in the ownership, control, management responsibilities, risks, and profits of the joint venture. The DVBE joint venture must submit the joint venture agreement with the Caltrans Bidder DVBE Information form required in Section 2-1.02B, "Submission of DVBE Information," elsewhere in these special provisions.

Section 10115 of the Public Contract Code requires the Department to establish a goal for Disabled Veteran Business Enterprise (DVBE) participation in contracts.

2-1.02A DVBE GOAL FOR THIS PROJECT

The Disabled Veteran Business Enterprise (DVBE) participation goal for this project: 5 percent.

The Office of Small Business and DVBE Services, Department of General Services, is located at 707 Third Street, West Sacramento, CA 95605. It may be contacted at (800) 559-5529 or (916) 375-4940 or its internet web site at <http://www.pd.dgs.ca.gov/smbus/default.htm> for program information.

2-1.02B SUBMISSION OF DVBE INFORMATION

The required DVBE information shall be submitted on the "CALTRANS BIDDER - DVBE INFORMATION" form included in the Proposal. If this information is not submitted with the bid, the DVBE information forms shall be removed from the documents prior to submitting the bid.

If the DVBE information is not submitted with the bid, the apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit the DVBE information to the following address: Department of Transportation, MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, California 95816 so the information is received by the Department no later than 4:00 p.m. on the fourth business day following bid opening. The Department will not accept facsimile submittals of DVBE information. Failure to submit the required DVBE information by the time specified will be grounds for finding the bid or proposal nonresponsive. Other bidders need not submit DVBE information unless requested to do so by the Department.

The bidder's DVBE information shall establish that either it met the goal or that, prior to bidding, it made good faith efforts to meet the goal. Information demonstrating that a good faith effort to meet the DVBE goal has been made by the bidder shall be submitted on the "DVBE INFORMATION GOOD FAITH EFFORTS" form included in the Proposal.

Bidders are cautioned that even though their submittal indicates they will meet the stated DVBE goal, their submittal should also include their good faith efforts information along with their DVBE goal information to protect their eligibility for award of the contract in the event the Department, in its review, finds that the goal has not been met.

The bidder's DVBE information shall include the names of all DVBE firms that will participate, with a complete description of work or supplies to be provided by each and the dollar value of each DVBE transaction. When 100 percent of a contract item of work is not to be performed or furnished by a DVBE, a description of the exact portion of that work to be performed or furnished by that DVBE shall be included in the DVBE information, including the planned location of that work.

A bidder shall be deemed to have made good faith efforts if, within the time specified by the Department, it submits documentary evidence that all of the following actions were taken:

- A. Contact was made with the Office of Small Business and DVBE Services, Department of General Services or their web site at <http://www.pd.dgs.ca.gov/smbus/default.htm> to identify Disabled Veteran Business Enterprises.
- B. Advertising was published in trade media and media focusing on Disabled Veteran Business Enterprises, unless time limits imposed by the Department do not permit that advertising.
- C. Invitations to bid were submitted to potential Disabled Veteran Business Enterprise contractors.
- D. Available Disabled Veteran Business Enterprises were considered.

2-1.03 SMALL BUSINESS AND NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCES

Attention is directed to the Small Business Procurement and Contract Act, Government Code Section 14835, et seq. and to the Small Business regulations at Title 2, California Code of Regulations, Section 1896, et seq.

Bidders, subcontractors, and suppliers who wish to be certified as Small Businesses under the provisions of those laws and regulations, shall be certified as Small Business by the Office of Small Business and DVBE Services, Department of General Services, 707 Third Street, West Sacramento, CA 95605.

Attention is directed to "Award and Execution of Contract" of these special provisions.

2-1.03A SMALL BUSINESS PREFERENCE

To request Small Business Preference, bidders shall fill out and sign the "Request for Small Business Preference and Non-Small Business Subcontractor Preference" form in the Proposal and shall attach a copy of their Office of Small Business and DVBE Services Small Business Certification letter to the form. The bidder's signature on the "Request for Small Business Preference" certifies that the bidder is certified as a Small Business at the time and day of bid opening or has applied for certification and is subsequently certified by the Department of General Services.

2-1.03B NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCE

To request Non-Small Business Subcontractor Preference, bidders shall fill out and sign the "Request for Small Business Preference and Non-Small Business Subcontractor Preference" form in the Proposal. The bidder's signature certifies that the bidder commits to subcontract at least 25 percent of its bid amount with one or more subcontractors or suppliers that are certified as Small Businesses.

The bidder shall also fill out the "CALTRANS BIDDER – SMALL BUSINESS SUBCONTRACTOR - INFORMATION" form. If the Small Business Subcontractor information is not submitted with the bid, the form shall be removed from the documents and submitted in the same time and manner specified for DVBE Information in "Submission of DVBE Information" of these special provisions. The bidder shall attach a copy of the Office of Small Business and DVBE Services small business certification letter for each listed subcontractor or supplier, to the form. The listed subcontractors and suppliers shall be certified as Small Business at the time and day of bid opening or have applied for certification and are subsequently certified by the Department of General Services. Each listed subcontractor or supplier shall be designated to perform a commercially useful function.

2-1.04 CALIFORNIA COMPANY PREFERENCE

Attention is directed to "Award and Execution of Contract" of these special provisions.

In conformance with the requirements of Section 6107 of the Public Contract Code, a "California company" will be granted a reciprocal preference for bid comparison purposes as against a nonresident contractor from any state that gives or requires a preference to be given contractors from that state on its public entity construction contracts.

A "California company" means a sole proprietorship, partnership, joint venture, corporation, or other business entity that was a licensed California contractor on the date when bids for the public contract were opened and meets one of the following:

- A. Has its principal place of business in California.
- B. Has its principal place of business in a state in which there is no local contractor preference on construction contracts.
- C. Has its principal place of business in a state in which there is a local contractor construction preference and the Contractor has paid not less than \$5000 in sales or use taxes to California for construction related activity for each of the five years immediately preceding the submission of the bid.

To carry out the "California company" reciprocal preference requirements of Section 6107 of the Public Contract Code, all bidders shall fill out and sign the California Company Preference form in the Proposal. The bidder's signature on the California Company Preference form certifies, under penalty of perjury, that the bidder is or is not a "California company" and if not, the amount of the preference applied by the state of the nonresident Contractor.

A nonresident Contractor shall disclose any and all bid preferences provided to the nonresident Contractor by the state or country in which the nonresident Contractor has its principal place of business.

Proposals without the California Company Preference form filled out and signed may be rejected.

2-1.05 DVBE INCENTIVE EVALUATION

The Department applies the Small Business and Non-Small Business preference during bid verification and proceeds with the following evaluation for DVBE incentive.

The Department grants a DVBE incentive to bidders who achieve a DVBE participation of 1 percent or greater of the value of their bid (Mil & Vet Code and Code of Regs § 1896.98 et seq).

The DVBE incentive is a reduction, for bid comparison only, in the total bid submitted by the lesser of:

- 1. Percentage of DVBE achievement, rounded to 2 decimal places
- 2. 5 percent of the total bid of the apparent low bidder
- 3. \$100,000

If the 2nd and 3rd low bids are within the lesser of 5 percent or \$100,000 from the low bid, the Department applies DVBE incentive to the 3 lowest bids and determines if bid ranking changes. New bid ranking cannot displace a small business bidder.

The Department proceeds with awarding the contract to the new apparent low bidder and posts the new verified bid results at:

http://www.dot.ca.gov/hq/esc/oe/awards/bidsum_html/6week_list.html.

2-1.06 SMALL BUSINESS ENTERPRISE GOAL

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.

Contractors, subcontractors, suppliers, and service providers who qualify as small business are encouraged to apply for certification as a small business by submitting their application to:

Office of Small Business and DVBE Services
Department of General Services
707 Third Street
West Sacramento, CA 95605
(916) 375-4940 or (800) 559-5529

2-1.07 PRE-AWARD QUALIFICATION QUESTIONNAIRE

Bidders shall submit responses to the "Pre-Award Qualification Questionnaire" included in the Proposal. Responses to the questionnaire shall be submitted with the bid.

Joint venture contactors shall submit a combined "Pre-Award Qualification Questionnaire" providing separate responses for each joint venture partner.

In signing the signature page of the Proposal, the bidder certifies that the information and answers in response to the questionnaire are complete and accurate. Failure to completely answer the questionnaire may be a factor for rejection of the bid.

The bidder's attention is directed to "Pre-Award Qualifications Review," of these special provisions for the requirements of acceptance of bid.

Upon approval of the contract, the completed "Pre-Award Qualification Questionnaire" of each unsuccessful bidder will be returned, unless a determination of non-qualification has been made by the Department, or the award of the contract has been challenged.

2-1.08 ESCROW OF BID DOCUMENTATION

Bid documentation shall consist of all documentary and calculated information generated by the Contractor in preparation of the bid. The bid documentation shall conform to the requirements in these special provisions, and shall be submitted to the Department and held in escrow for the duration of the contract.

The escrowed bid documents will be the only documents accepted from the Contractor regarding preparation of the bid.

In signing the proposal, the bidder certifies that the material submitted for escrow constitutes all the documentary information used in preparation of the bid and that he has personally examined the contents of the container and that they are complete.

The first, second and third apparent low bidders shall submit to the Department of Transportation, District 11 Construction Duty Senior 4050 Taylor Street, San Diego, CA 92110 (619) 688-6635, fax (619) 688-6988 the identification of the bidder's representative authorized to present the bid documentation and the persons responsible for preparing the bidder's estimate before the close of business on the first Monday after bid opening.

Nothing in the bid documentation shall be construed to change or modify the terms or conditions of the contract.

Escrowed bid documentation will not be used for pre-award evaluation of the Contractor's anticipated methods of construction, nor to assess the Contractor's qualifications for performing the work.

Bid documentation shall clearly itemize the Contractor's estimated costs of performing the work. The documentation submitted shall be complete and so detailed as to allow for an in-depth analysis of the Contractor's estimate.

The Contractor shall submit its bid documentation which shall include:

1. Quantity takeoffs
2. Rate schedules for the direct costs and the time- and nontime-related indirect costs for:
 - a. Labor (by craft)
 - b. Plant and equipment ownership and operation
 - c. Permanent and expendable material
 - d. Insurance and subcontracted work
3. Estimated construction schedules, including sequence and duration and development of production rates
4. Quotations, terms and limitations of quotes and subcontracts related to subcontractors, manufacturers and suppliers
5. Estimates of field and home office overhead
6. Contingency and margin for each contract item of work
7. Names of the persons responsible for preparing the bidder's estimate, and other reports, calculations, assumptions and supplemental information used by the bidder to arrive at the estimate submitted with the proposal
8. Bid documentation for each subcontractor, manufacturer and supplier whose subcontract or purchase orders exceed or are expected to exceed \$250,000.00. Bid documentation for other subcontractors, manufacturers, and suppliers may be submitted, if required by the Contractor, or requested by the subcontractor, manufacturer, or supplier

If required by the Contractor or requested by the subcontractor, manufacturer, or supplier, additional information may be submitted by the subcontractor, manufacturer, or supplier. Subcontractor, manufacturer and supplier bid documentation shall conform to the requirements for the Contractor's documentation and shall be enclosed with the Contractor's submittal regardless of whether or not subcontracts or purchase orders have been executed or entered into on the date that bid documentation is submitted for escrow. If at the time that bid documentation is submitted for escrow, the subcontractor, manufacturer or supplier does not have an executed subcontract or purchase order, and a subcontract or purchase order is subsequently executed, then a copy of the executed subcontract or purchase order shall be submitted into escrow within 14 days of the execution of the respective subcontract or purchase orders. The examination of subcontractors', manufacturers' and suppliers' bid documentation will be accomplished in the same manner as for the Contractor's bid documentation. If a subcontractor, manufacturer or supplier is replaced, bid documentation for the new subcontractor, manufacturer or supplier shall be submitted for review and escrow before authorization for the substitution will be granted. Upon written request of a subcontractor, manufacturer or supplier, the bid documentation from that subcontractor, manufacturer or supplier shall be reviewed only by the subcontractor, manufacturer or supplier and the Department and shall be placed in a separate container within the Contractor's container. The written request from the subcontractor, manufacturer or supplier shall be included with the bid documentation.

If the bidder is a joint venture, the bid documentation shall include the joint venture agreement, the joint venture estimate comparison and final reconciliation of the joint venture estimate.

Copies of the proposals submitted by the first, second and third low bidders will be provided to the District for inclusion in the bid documentation to be escrowed.

The first, second, and third apparent low bidders shall present the bid documentation for escrow at the District 11 Office, Construction Duty Senior (619) 688-6635, 4050 Taylor Street, San Diego, CA 92110, on the first Tuesday between 1:00 p.m. and 2:00 p.m., following the time indicated in the "Notice to Contractors" for the opening of bids. The fourth and subsequent apparent low bidders shall present the bid documentation for escrow if requested by the Department to do so.

Bid documentation shall be submitted as a paper copy in a sealed container, clearly marked with the bidder's name, date of submittal, project contract number and the words, "Bid Documentation for Escrow."

Failure to submit the actual and complete bid documentation as specified herein within the time specified shall be cause for rejection of the proposal.

Upon submittal, the bid documentation of the apparent low bidder will be examined and inventoried by the duly designated representatives of the Contractor and the Department to ensure that the bid documentation is authentic, legible, and in accordance with the terms of this section "Escrow of Bid Documentation." The examination will not include review of, nor will it constitute approval of, proposed construction methods, estimating assumptions or interpretation of the contract. The examination will not alter any conditions or terms of the contract. The acceptance or rejection by the Department that the submitted bid documents are in compliance with this section "Escrow of Bid Documentation" shall be completed within 48 hours of the time the bid documentation is submitted by the Contractor.

At the completion of the examination, the bid documents will be sealed and jointly deposited at an agreed commercial business in San Diego, CA.

Bid documentation submitted by the second and third apparent low bidders will be jointly deposited at an agreed commercial businesses in San Diego, CA. If the apparent low bid is withdrawn or rejected, the bid documentation of the second low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. If the second low bid is withdrawn or rejected, the bid documentation of the third low bidder will be examined and inventoried in the manner specified above, then sealed and deposited again in escrow. Bid documentation from subsequent bidders, if requested, will be examined and inventoried in the same manner as specified above, then sealed and deposited in escrow. Upon execution and final approval of the contract or rejection of all bids, the bid documentation will be returned to any remaining unsuccessful bidders.

Any and all components of the escrowed bid documentation may be examined by the designated representatives of both the Department and the Contractor, at any time deemed necessary by either the Department or the Contractor to assist in the negotiation of price adjustments and change orders, or to assist in the potential resolution or in the settlement of claims or disputes. Such a joint review shall be performed within 15 days of receipt of a written request to do so by either party. If the Contractor refuses to participate in the joint examination of any and all components of the escrowed bid documentation as provided herein, such refusal shall be considered as a failure by the Contractor to exhaust administrative claim remedies with respect to the particular protest, notice of potential claim, or claim. In addition, this refusal by the Contractor shall constitute a bar to future arbitration with respect to the protest, potential claim or claim as provided by Section 10240.2 of the California Public Contract Code.

If requested by a Disputes Review Board, the escrowed bid documentation may be utilized to assist the Board in its recommendations.

The bid documentation submitted by the Contractor will be held in escrow until the contract has been completed, the ultimate resolution of all disputes and claims has been achieved and receipt of final payment has been accepted by the Contractor. The escrowed bid documentation will then be released from escrow to the Contractor.

The bid documentation submitted by the bidder is, and shall remain, the property of the bidder, and is subject to only joint review by the Department and the bidder or upon written request of a subcontractor, manufacturer or supplier shall be reviewed only by the subcontractor, supplier or manufacturer and the Department unless it involves a dispute or claim. The Department stipulates and expressly acknowledges that the submitted bid documentation constitutes trade secrets and will not be deemed public records. This acknowledgment is based on the Department's express understanding that the information contained in the bid documentation is not known outside the bidder's business, is known only to a limited extent and only by a limited number of employees of the bidder, is safeguarded while in the bidder's possession, is extremely valuable to the bidder and could be extremely valuable to the bidder's competitors by virtue of it reflecting the bidder's contemplated techniques of construction. The Department acknowledges that the bid documentation includes a compilation of information used in the bidder's business, intended to give the bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. The Department agrees to safeguard the bid documentation, and all information contained therein, against disclosure, including disclosure of subcontractor bid documentation to the Contractor and other subcontractors to the fullest extent permitted by law. However, in the event of arbitration or litigation, the bid documentation shall be subject to discovery, and the Department assumes no responsibility for safeguarding the bid documentation unless the Contractor has obtained an appropriate protective order issued by the arbitrator or the court.

Full compensation for preparing the bid documentation, presenting it for escrow and reviewing it for escrow and upon request of the Engineer shall be considered as included in the various items of work, and no additional compensation will be allowed therefor.

The direct cost of depositing the bid documentation in escrow at the agreed commercial business will be paid by the State.

SECTION 3. PRE-AWARD QUALIFICATION REVIEW AND AWARD AND EXECUTION OF CONTRACT

3-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 3, "Award and Execution of Contract," of the Standard Specifications and these special provisions for the requirements and conditions concerning award and execution of contract.

Requests for relief of bid and bid protests are to be delivered to the following address: Department of Transportation, MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816 or by facsimile to the Office Engineer at (916) 227-6282.

3-1.015 PRE-AWARD QUALIFICATIONS REVIEW

The Engineer will review the responses to the "Pre-Award Qualification Questionnaire" submitted by the apparent low bidder and the Engineer will make a determination on the bidder's qualifications for performing the work in a manner that is safe for the workers and the public, based on the bidder's experience, qualifications of the on-site supervisory personnel, equipment, conceptual approach to the work, and safety history of the bidder and its supervisory personnel.

If the Engineer determines it necessary, a pre-award qualifications review meeting will be conducted by an agent of the Director, and the apparent low bidder shall participate. Notification of whether a meeting will be conducted will be provided on or before the first Thursday following the time indicated in the "Notice to Contractors" for the opening of bids. The meeting, if held, will be on second Thursday following the time indicated in the "Notice to Contractors" for the opening of bids at 10:00 a.m. in the third floor conference room, 1727 30th Street, Sacramento, CA. 95816. Non-attendance by the apparent low bidder at the pre-award qualifications review meeting shall be just cause for rejection of the bid and forfeiture of the proposal guaranty.

At the pre-award qualifications review meeting, the low bidder shall be prepared to discuss and answer questions relative to the responses to the "Pre-Award Qualification Questionnaire." The Director's agent will prepare written findings and recommendations to the Engineer regarding award of the contract to the apparent low bidder based on the "Pre-Award Qualification Questionnaire" and responses submitted, and on the information provided at the pre-award qualifications review meeting, if held. The decision of the Engineer regarding the bidder's qualifications shall be final.

The second and third apparent bidders shall participate in pre-award qualifications review meetings if requested to do so by the Department. Notification by the Department will be provided a least 48 hours prior to the pre-award qualifications review meeting. Non-attendance by the second or third apparent low bidder at any such requested meeting shall be just cause for rejection of bid and forfeiture of the proposal guaranty.

3-1.017 AWARD AND EXECUTION OF CONTRACT

The award of the contract will be made within 60 days after the opening of the proposals. This period will be subject to extension for a further period as may be agreed upon in writing between the Department and the bidder concerned.

The contract will be awarded to the lowest responsible bidder meeting the contract requirements.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications, to the Department so that it is received within 10 business days after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A Small Business Participation Report will be included in the contract documents to be executed by the successful bidder. The purpose of this form is to collect small business participation data. Even if no small business participation is reported, the successful bidder must execute and return the form.

A "Payee Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract, contract bonds and the documents identified in Section 3-1.025, "Insurance Policies," of the Standard Specifications. For the purposes of the form, payee shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Payee Data Record" form to the Department as provided herein will result in the retention of 20 percent of payments due the Contractor and penalties of up to \$20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

Attention is also directed to "Small Business and Non-Small Business Subcontractor Preferences" of these special provisions.

A bidder who is certified as a Small Business by the Office of Small Business and DVBE Services, Department of General Services, will be allowed a preference in the award of this contract under the following conditions:

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- A. The bidder filled out and signed the "Request for Small Business Preference and Non-Small Business Subcontractor Preference" form, requesting Small Business preference, and attached a copy of its Office of Small Business and DVBE Services small business certification letter to the form; and
- B. The apparent low bidder is not certified as a Small Business.

A bidder who is not certified as a Small Business by the Office of Small Business and DVBE Services, Department of General Services, will be allowed a preference in the award of this contract under the following conditions:

- A. The bidder filled out and signed the "Request for Small Business Preference and Non-Small Business Subcontractor Preference" form, requesting Non-Small Business Subcontractor preference and notifying the Department that it commits to subcontract at least 25 percent of its bid amount with one or more Small Businesses, and submitted the "CALTRANS BIDDER – SMALL BUSINESS SUBCONTRACTOR – INFORMATION" form listing the subcontractors and suppliers it commits to subcontract with; and
- B. The apparent low bidder is not certified as a Small Business, and has not filled out and signed the "Request for Small Business Preference and Non-Small Business Subcontractor Preference."

The Small Business preference will be a reduction in the bid submitted by the Small Business contractor, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed \$50,000. If this reduction results in the Small Business contractor becoming the low bidder, or in a precise tie with a Non-Small Business apparent low bidder, then the contract will be awarded to the Small Business contractor on the basis of the actual bid of the Small Business contractor notwithstanding the reduced bid price used for bid comparison purposes.

The Non-Small Business Subcontractor preference will be a reduction in the bid submitted by the Non-Small Business contractor requesting the preference, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed \$50,000. If this reduction results in the Non-Small Business contractor requesting the preference becoming the low bidder, or in a precise tie with a Non-Small Business apparent low bidder not requesting the preference, then the contract will be awarded to the Non-Small Business contractor requesting the preference on the basis of its actual bid notwithstanding the reduced bid price used for bid comparison purposes. Application of the Non-Small Business Subcontractor preference shall not result in the displacement of a Small Business in winning the award.

Attention is also directed to "California Company Preference" of these special provisions.

The amount of the California company reciprocal preference shall be equal to the amount of the preference applied by the state of the nonresident contractor with the lowest responsive bid, except where the "California company" is eligible for a California Small Business Preference or a California Non-Small Business Subcontractor Preference, in which case the preference applied shall be the greater of the two, but not both.

If the bidder submitting the lowest responsive bid is not a "California company" and with the benefit of the reciprocal preference, a "California company's" responsive bid is equal to or less than the original lowest responsive bid, the "California company" will be awarded the contract at its submitted bid price except as provided below.

Small Business bidders shall have precedence over Non-Small Business bidders in that the application of the "California company" preference for which Non-Small Business bidders may be eligible shall not result in the denial of the award to a Small Business bidder.

DVBE bidders shall have precedence over Non-DVBE bidders in that in the event the application of the Small Business preference to more than one bidder results in a precise tie in the bid amounts used for comparison purposes, the award shall go to the DVBE that is also a small business. This precedence shall not apply to the application of the California company reciprocal preference.

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

The first working day is the fifteenth day after contract approval.

The work shall be diligently prosecuted to completion before the expiration of 600 WORKING DAYS.

The Contractor shall pay to the State of California the sum of \$15,000 per day for each day's delay in finishing the work.

SECTION 5. GENERAL

SECTION 5-1. MISCELLANEOUS

5-1.01 GUARANTEE

GENERAL

The Contractor shall guarantee the work is in accordance with contract requirements and remains free from substantial defects in materials and workmanship for a period of one year after contract acceptance. For certain portions of the work where the Director relieves the Contractor of responsibility in accordance with Section 7-1.15, "Relief from Maintenance and Responsibility," of the Standard Specifications, the guarantee period starts on the relief date and ends one year thereafter.

Substantial defects in materials and workmanship means defective work objectively manifested by damaged, displaced, or missing parts or components and workmanship resulting in improper function of materials, components, equipment, or systems, as installed or manufactured by the Contractor, subcontractor, supplier, or manufacturer.

During the guarantee period, the Contractor shall repair or replace contract work and associated work which is not in accordance with contract requirements or has substantial defects in materials and workmanship. The Contractor shall perform the corrective work with no expense to the Department other than State-provided field inspection services.

The guarantee of work excludes damage or displacement that is outside the control of the Contractor and caused by normal wear and tear, improper operation, insufficient maintenance, abuse, unauthorized modification, or natural disaster as described in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications.

The Contractor shall have the same insurance coverage during corrective work operations as prior to contract acceptance, in accordance with Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The contract bonds furnished in accordance with Section 3-1.02, "Contract Bonds," of the Standard Specifications must remain in full force and effect during the guarantee period and until all corrective work is complete.

In the case of conflict between this guarantee provision and any warranty provision included in the contract, the warranty provision shall govern for the specific construction product or feature covered.

CORRECTIVE WORK

During the guarantee period, the Department will monitor performance of the highway facilities completed by the Contractor and will perform a thorough review of the contract work at least 60 days before the expiration of the one-year guarantee.

If the Engineer discovers contract work not in compliance with contract requirements or that has substantial defects in materials and workmanship, at any time during the guarantee period, a list of items that require corrective work will be developed and forwarded to the Contractor. Within 15 days of receipt of a list, the Contractor shall submit to the Engineer a detailed plan for performing corrective work. The work plan shall include a start to finish schedule. It shall include a list of labor, equipment, materials, and any special services intended to be used. It shall clearly show related work including traffic control, temporary delineation, and permanent delineation.

The Contractor shall start the corrective and related work within 15 days of receiving notice from the Engineer that the Contractor's work plan is approved. The corrective work shall be diligently prosecuted and completed within the time allotted in the approved work plan.

If the Engineer determines that corrective work, covered by the guarantee, is urgently needed to prevent injury or property damage, the Engineer will give the Contractor a request to start emergency repair work and a list of items that require repair work. The Contractor shall mobilize within 24 hours and diligently perform emergency repair work on the damaged highway facilities. The Contractor shall submit a work plan within 5 days of starting emergency repair work.

If the Contractor fails to commence and execute, with due diligence, corrective work and related work required under the guarantee in the time allotted, the Engineer may proceed to have the work performed by State forces or other forces at the Contractor's expense. Upon demand, the Contractor shall pay all costs incurred by the Department for work performed by State forces or other forces including labor, equipment, material, and special services.

PAYMENT

Full compensation for performing corrective work; and related work such as traffic control, temporary delineation, and permanent delineation, and to maintain insurance coverage and bonds, shall be considered as included in the contract prices paid for the various contract items of work and no separate payment will be made therefor.

5-1.019 COST REDUCTION INCENTIVE

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

Prior to preparing a written cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, overall merit of the proposal, and review times required by the Department and other agencies.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in contract time, 50 percent of that contract time reduction shall be credited to the State by reducing the contract working days, not including plant establishment. Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding the working days.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in traffic congestion or avoids traffic congestion during construction, 60 percent of the estimated net savings in construction costs attributable to the cost reduction proposal will be paid to the Contractor. In addition to the requirements in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, the Contractor shall provide detailed comparisons of the traffic handling between the existing contract and the proposed change, and estimates of the traffic volumes and congestion.

5-1.02 LABOR NONDISCRIMINATION

Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM

(GOV. CODE, SECTION 12990)

Your attention is called to the "Nondiscrimination Clause", set forth in Section 7-1.01A(4), "Labor Nondiscrimination," of the Standard Specifications, which is applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth therein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of \$5000 or more.

5-1.03 INTEREST ON PAYMENTS

Interest shall be payable on progress payments, payments after acceptance, final payments, extra work payments, and claim payments as follows:

- A. Unpaid progress payments, payment after acceptance, and final payments shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
- B. Unpaid extra work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed extra work bill. To be properly submitted, the bill must be submitted within 7 days of the performance of the extra work and in conformance with the provisions in Section 9-1.03C, "Records," and Section 9-1.06, "Partial Payments," of the Standard Specifications. An undisputed extra work bill not submitted within 7 days of performance of the extra work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
- C. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and extra work payments shall be 10 percent per annum.
- D. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of said claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

5-1.04 PUBLIC SAFETY

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications and these special provisions.

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

- A. Excavations—The near edge of the excavation is 3.6 m or less from the edge of the lane, except:
 1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
 2. Excavations less than 0.3-m deep.
 3. Trenches less than 0.3-m wide for irrigation pipe or electrical conduit, or excavations less than 0.3-m in diameter.

4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
 5. Excavations in side slopes, where the slope is steeper than 1:4 (vertical:horizontal).
 6. Excavations protected by existing barrier or railing.
- B. Temporarily Unprotected Permanent Obstacles—The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.
- C. Storage Areas—Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3-m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6-m minimum offset cannot be achieved, the temporary railing shall 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 shall be installed at the approach end of the temporary railing.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane unless otherwise provided in the Standard Specifications and these special provisions:

| Approach Speed of Public Traffic (Posted Limit)
(Kilometers Per Hour) | Work Areas |
|--------------------------------------------------------------------------|----------------------------------------------------------|
| Over 72 (45 Miles Per Hour) | Within 1.8 m of a traffic lane but not on a traffic lane |
| 56 to 72 (35 to 45 Miles Per Hour) | Within 0.9-m of a traffic lane but not on a traffic lane |

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 3 m without written approval from the Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

Full compensation for conforming to the provisions in this section "Public Safety," including furnishing and installing temporary railing (Type K) and temporary crash cushion modules, 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.

5-1.05 TESTING

Testing of materials and work shall conform to the provisions in Section 6-3, "Testing," of the Standard Specifications and these special provisions.

Whenever the provisions of Section 6-3.01, "General," of the Standard Specifications refer to tests or testing, it shall mean tests to assure the quality and to determine the acceptability of the materials and work.

The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Department, and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If delay of work in the area delays the current controlling operation, the delay will be considered a right of way delay and the Contractor will be compensated for the delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

5-1.065 SOLID WASTE DISPOSAL AND RECYCLING REPORT

This work shall consist of reporting disposal and recycling of construction solid waste, as specified in these special provisions. For the purposes of this section, solid waste includes construction and demolition waste debris, but not hazardous waste.

Annually by the fifteenth day of January, the Contractor shall complete and certify Form CEM-4401, "Solid Waste Disposal and Recycling Report," which quantifies solid waste generated by the work performed and disposed of in landfills or recycled during the previous calendar year. The amount and type of solid waste disposed of or recycled shall be reported in tons. The Contractor shall also complete and certify Form CEM-4401 within 5 days following contract acceptance.

Form CEM-4401, "Solid Waste Disposal and Recycling Report" can be downloaded from the following website:

<http://www.dot.ca.gov/hq/construc/manual2001>

If the Contractor has not submitted Form CEM-4401, by the dates specified above, the Department will withhold the amount of \$10,000 for each missing or incomplete report. The moneys withheld will be released for payment on the next monthly estimate for partial payment following the date that a complete and acceptable Form CEM-4401 is submitted to the Engineer. Upon completion of all contract work and submittal of the final Form CEM-4401, remaining withheld funds associated with this section, "Solid Waste Disposal and Recycling Report," will be released for payment. Withheld funds in conformance with this section shall be in addition to other moneys withheld provided for in the contract. No interest will be due the Contractor on withheld amounts.

Full compensation for preparing and submitting Form CEM-4401, "Solid Waste Disposal and Recycling Report," shall be considered as included in the contract price for the various items of work involved and no additional compensation will be allowed therefor.

5-1.07 (BLANK)

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5-1.09 SUBCONTRACTING

Attention is directed to the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, Section 2, "Proposal Requirements and Conditions," and Section 3, "Award and Execution of Contract," of these special provisions.

Pursuant to the provisions in Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations web site at:

<http://www.dir.ca.gov/DLSE/Debar.html>

Unauthorized substitution of a listed subcontractor may constitute a violation of the "Subletting and Subcontracting Fair Practices Act" and may subject the Contractor to the penalties imposed therein.

5-1.09A DVBE SUBCONTRACTING

The DVBEs listed by the Contractor in response to the provisions in Section 2-1.02B, "Submission of DVBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DVBEs, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Unauthorized substitution of a DVBE may also constitute a violation of California Code of Regulations Section 1896.64. The Contractor shall not be entitled to payment for the work or material unless it is performed or supplied by the listed DVBE or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

The provisions in Section 2-1.02, "Disabled Veteran Business Enterprise (DVBE)," of these special provisions that DVBEs shall be certified on the date bids are opened does not apply to substitutions after award of the contract.

The Contractor shall maintain records of all subcontracts entered into with certified DVBE subcontractors and records of materials purchased from certified DVBE suppliers. The records shall show the name and business address of each DVBE subcontractor or vendor and the total dollar amount actually paid each DVBE subcontractor or vendor.

The Contractor agrees that the awarding department will have the right to review, obtain and copy all records pertaining to performance of DVBEs during the contract. The Contractor agrees to provide the awarding department with any relevant information requested and shall permit access to its premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts and other material that may be relevant to a matter under investigation for the purpose of determining compliance with Public Contract Code Section 10115 et seq. The Contractor further agrees to maintain such records for a period of three (3) years after final payment under the contract.

5-1.09B NON-SMALL BUSINESS SUBCONTRACTING

The Small Business subcontractors listed by the Contractor in response to the provisions in Section 2-1.03B, "Non-small Business Subcontractor Preference," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified as Small Business, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Unauthorized substitution of a Small Business subcontractor may also constitute a violation of California Code of Regulations Section 1896.10 and may subject the Contractor to the sanctions referenced therein.

The provisions in Section 2-1.03B, "Non-small Business Subcontractor Preference," of these special provisions that Small Business subcontractors shall be certified on the date bids are opened does not apply to substitutions after award of the contract.

The Contractor shall maintain records of all subcontracts entered into with certified Small Business subcontractors and records of materials purchased from certified Small Business suppliers. The records shall show the name and business address of each Small Business subcontractor or vendor and the total dollar amount actually paid each Small Business subcontractor or vendor.

Contractor agrees that the awarding department will have the right to review, obtain and copy all records pertaining to performance of Small Businesses during the contract. The Contractor agrees to provide the awarding department with any relevant information requested and shall permit access to its premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts and other material that may be relevant to a matter under investigation for the purpose of determining compliance with California Code of Regulations Section 1896, et seq. The Contractor further agrees to maintain such records for a period of three (3) years after final payment under the contract.

5-1.10 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS

Attention is directed to the provisions in Sections 10262 and 10262.5 of the Public Contract Code concerning prompt payment to subcontractors.

5-1.103 RECORDS

The Contractor shall maintain cost accounting records for the contract pertaining to, and in such a manner as to provide a clear distinction between, the following six categories of costs of work during the life of the contract:

- A. Direct costs of contract item work.
- B. Direct costs of changes in character in conformance with Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications.
- C. Direct costs of extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.
- D. Direct costs of work not required by the contract and performed for others.
- E. Direct costs of work performed under a notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications.
- F. Indirect costs of overhead.

Cost accounting records shall include the information specified for daily extra work reports in Section 9-1.03C, "Records," of the Standard Specifications. The requirements for furnishing the Engineer completed daily extra work reports shall only apply to work paid for on a force account basis.

The cost accounting records for the contract shall be maintained separately from other contracts, during the life of the contract, and for a period of not less than 3 years after the date of acceptance of the contract. If the Contractor intends to file claims against the Department, the Contractor shall keep the cost accounting records specified above until complete resolution of all claims has been reached.

5-1.104 INTERNET DAILY EXTRA WORK REPORT

When extra work is being paid for on a force account basis, the Contractor shall submit daily extra work reports in conformance with the provisions in Section 9-1.03C, "Records," of the Standard Specifications and these special provisions.

The Contractor shall send daily extra work reports to the Engineer using the Department's Internet extra work billing system. The reports shall conform to the requirements in the "iCAS User's Guide" (Guide). The Guide is available from the Department, and is also found on the Internet at:

http://www.dot.ca.gov/hq/construc/ewb/EWB_INSTRUCTION.pdf

The Department will provide system accounts to the Contractor's authorized representatives when at least one of the representatives has received training. The Department will provide system training to at least one of the Contractor's authorized representatives within 30 days of the Contractor's request for training. The Department will assign an account and user identification to the Contractor's authorized representatives, and each Contractor's authorized representative shall maintain a unique password. A daily extra work report that the Contractor's authorized representative sends to the Department using the Internet extra work billing system will be considered signed by the Contractor. A daily extra work report that the Engineer approves using the Internet extra work billing system will be considered signed by the Engineer.

Daily extra work reports that include billing for materials shall be substantiated by a valid copy of a vendor's invoice in conformance to the requirements in Section 9-1.03C, "Records," of the Standard Specifications. Each materials invoice shall clearly identify the relative daily extra work report and the associated cost of the materials. In addition to postal service and parcel service and if approved by the Engineer, invoices may be sent by facsimile or as an electronic-mail attachment.

The Contractor shall maintain the Contractor's interface with the Department's Internet extra work billing system. If the Contractor is using the file transfer process to submit extra work reports, it shall conform to the file transfer format and process defined in the Guide.

5-1.105 ARCHAEOLOGICAL DISCOVERIES

If archaeological materials, including but not limited to human skeletal material and disarticulated human bone, are discovered at the job site, protect and leave undisturbed and in place archaeological materials in accordance with the following codes and these special provisions:

1. California Public Resources Code, Division 5, Chapter 1.7 § 5097.5
2. California Public Resources Code, Division 5, Chapter 1.75 § 5097.98 and § 5097.99
3. California Administrative Code, Title 14 § 4308
4. California Penal Code, Part 1, Title 14 § 622-1/2
5. California Health and Safety Code, Division 7, Part 1, Chapter 2, § 7050.5

Archaeological materials are the physical remains of past human activity and include historic-period archaeological materials and prehistoric Native American archaeological materials. Nonhuman fossils are not considered to be archaeological except when showing direct evidence of human use or alteration or when found in direct physical association with archaeological materials as described in these special provisions.

Historic-period archaeological materials include cultural remains beginning with initial European contact in California, but at least 50 years old. Historical archaeological materials include:

1. Trash deposits or clearly defined disposal pits containing tin cans, bottles, ceramic dishes, or other refuse indicating previous occupation or use of the site
2. Structural remains of stone, brick, concrete, wood, or other building material found above or below ground or
3. Human skeletal remains from the historic period, with or without coffins or caskets, including any associated grave goods

Prehistoric Native American archaeological materials include:

1. Human skeletal remains or associated burial goods such as beads or ornaments
2. Evidence of tool making or hunting such as arrowheads and associated chipping debris of fine-grained materials such as obsidian, chert, or basalt
3. Evidence of plant processing such as pestles, grinding slabs, or stone bowls
4. Evidence of habitation such as cooking pits, stone hearths, packed or burnt earth floors or
5. Remains from food processing such as concentrations of discarded or burnt animal bone, shellfish remains, or burnt rocks used in cooking

Immediately upon discovery of archaeological materials, stop all work within a 18.5 meter radius of the archaeological materials and immediately notify the Engineer. Archaeological materials found during construction are the property of the State. Do not resume work within the 18.5 meter radius of the find until the Engineer gives you written approval. If, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of an archeological 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," of the Standard Specifications.

The Department may use other forces to investigate and recover archaeological materials from the location of the find. When ordered by the Engineer furnish labor, material, tools and equipment, to secure the location of the find, and assist in the investigation or recovery of archaeological materials and the cost will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Full compensation for immediately notifying the Engineer upon discovery of archaeological materials and leaving undisturbed and in place archaeological materials discovered on the job site shall be considered as included in the contract price paid for various items of work involved and no additional compensation will be allowed therefor.

5-1.11 PARTNERING

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship is to maintain a cooperative communication and to mutually resolve conflicts at the lowest responsible management level.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering Workshop," selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties. If agreed to by the parties, additional "Partnering Workshops" will be conducted as needed throughout the life of the contract.

A one-day "Training in Partnering Concepts" session will be conducted regardless of whether the Contractor requests the formation of a "Partnering" relationship. The "Training in Partnering Concepts" session will be conducted locally for the Contractor's and the Engineer's project representatives. The Contractor shall be represented by a minimum of 2 representatives, one being the Contractor's authorized representative pursuant to Section 5-1.06, "Superintendence," of the Standard Specifications. Scheduling of the "Training in Partnering Concepts" session and selection of the trainer and training site shall be determined cooperatively by the Contractor and the Engineer. If, upon the Contractor's request, "Partnering" is approved by the Engineer, the "Training in Partnering Concepts" session shall be conducted prior to the initial "Partnering Workshop."

The costs involved in providing the "Training in Partnering Concepts" trainer and training site will be borne entirely by the State. The costs will be determined in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor the sum of that cost, except no markups will be allowed.

The costs involved in providing the "Partnering Workshop" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Partnering Workshop" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with "Training in Partnering Concepts" and "Partnering Workshops" will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

5-1.114 VALUE ANALYSIS

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer, scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

<http://www.dot.ca.gov/hq/oppd/value/>

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

5-1.12 DISPUTE REVIEW BOARD

GENERAL

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established by the Engineer and Contractor cooperatively upon approval of the contract. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications and these special provisions. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. The requirements and procedures established in this section shall be a prerequisite to filing a claim, filing for arbitration, or filing for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function as specified herein until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished reports. No DRB dispute meetings shall take place later than 30 days prior to acceptance of contract. After acceptance of contract, disputes or potential claims which have followed the dispute resolution processes of the Standard Specifications and these special provisions, but have not been resolved, shall be stated or restated by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The State will review those claims in conformance with the provisions in Section 9-1.07B of the Standard Specifications. Following the adherence to and completion of the contractual administrative claims procedure, the Contractor may file for arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications and these special provisions.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier potential claims not actionable against the Department as specified in these special provisions or quantification of disputes for overhead type expenses or costs. Disputes for overhead type expenses or costs shall conform to the requirements of Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

SELECTION PROCESS, DISCLOSURE AND APPOINTMENTS

The DRB shall consist of one member selected by the State and approved by the Contractor, one member selected by the Contractor and approved by the State, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as the DRB Chairperson.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. DRB members shall discharge their responsibilities impartially as an independent body,

considering the facts and circumstances related to the matters under consideration, pertinent provisions of the contract and applicable laws and regulations.

The State and the Contractor shall nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB nominee along with the prospective member's complete written disclosure statement.

Disclosure statements shall include a resume of the prospective member's experience and a declaration statement describing past, present, anticipated, and planned relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including but not limited to, relevant subcontractors or suppliers to the parties, parties' principals, or parties' counsel. DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the contract. Objections to nominees must be based on a specific breach or violation of nominee responsibilities or on nominee qualifications under these provisions unless otherwise specified. The Contractor or the State may, on a one-time basis, object to the other's nominee without specifying a reason and this person will not be selected for the DRB. Another person shall then be nominated within 15 days.

The first duty of the State and Contractor selected members of the DRB shall be to select and recommend a prospective third DRB member to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 15 days of the notification.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in the selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

The third prospective DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 15 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 DRB members are unable to agree upon a recommendation within their 15 day time limit. In the event of an impasse in selection of third DRB member the State and the Contractor shall each propose 3 candidates for the third DRB member position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

- A. Compensation for services on this DRB.
- B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
- C. Service as a member of other Dispute Review Boards on other contracts.
- D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.
- E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

The Contractor or the State may reject any of the three DRB members who fail to fully comply at all times with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and as specified herein. A copy of the Dispute Review Board Agreement is included in this section.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 15 days of the parties' concurrence in the selection of the third member. No DRB meeting shall take place until the Dispute Review Board Agreement has been signed by all parties. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute contract change orders shall be authorized to execute and administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

COMPENSATION

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates 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 State and Contractor. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the Department, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor, administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state the provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. 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 State will reimburse the Contractor for the State'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 State's share of DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

REPLACEMENT OF DRB MEMBERS

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.
- E. The State or Contractor may terminate the service of any member who fails to fully comply with all required employment and financial disclosure conditions of DRB membership

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 two parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

OPERATION

The following procedure shall be used for dispute resolution:

- A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and these special provisions, including the provision of applicable cost documentation; or file written protests or notices in conformance with the provisions in the Standard Specifications and these special provisions.
- B. The Engineer will respond, in writing, to the Contractor's written supplemental notice of potential claim within 20 days of receipt of the notice.
- C. Within 15 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.
- D. Following an objection to the Engineer's written response, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written response from the Engineer. 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.

- E. By failing to submit the written notice of referral to the DRB, within 21 days after receipt of the Engineer's written response to the supplemental notice of potential claim, the Contractor waives future claims and arbitration on the matter in contention.
- F. The Contractor and the State 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.
- G. 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. The DRB shall determine the time and location of the DRB dispute meeting, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of a timely hearing of the dispute.
- H. There shall be no participation of either party's attorneys at DRB dispute meetings.
- I. 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, including but not limited to consultants, except for expert testimony allowed at the discretion of the DRB and with approval prior to the dispute meeting by both parties.
- J. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB may request clarifying information of either party within 10 days after the DRB dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request. The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the DRB dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, pertinent provisions of the contract, applicable laws and regulations, and actual costs and time incurred as shown on the Contractor's cost accounting records. The DRB shall make recommendations on the merit of the dispute and, if appropriate, recommend guidelines for determining compensation.
- K. Within 30 days after receiving the DRB's report, both the State and the Contractor 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 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 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.
- L. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a 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.
- M. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.
- N. The State or the Contractor shall not call DRB members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.
- O. The State and Contractor 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.

- P. The 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 report.

DISPUTES INVOLVING SUBCONTRACTOR POTENTIAL CLAIMS

For purposes of this section, a "subcontractor potential claim" shall include any potential claim by a subcontractor (including also any pass through potential claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor potential claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

- A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor potential claim or potential claims.
- B. The Contractor shall include, as part of its submission pursuant to Step D above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind the subcontractor and with direct knowledge of the facts underlying the subcontractor potential claim. The Contractor shall submit a certification that the subcontractor potential claim is acknowledged and forwarded by the Contractor. The form for these certifications is available from the Engineer.
- C. At DRB dispute meetings involving one or more subcontractor potential claims, the Contractor shall require that each subcontractor involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor potential claim to assist in presenting the subcontractor potential claim and to answer questions raised by the DRB members or the Department's representatives.
- D. Failure by the Contractor to declare a subcontractor potential claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through potential claims) at the time of submission of the Contractor's potential claims, as provided hereunder, shall constitute a release of the State by the Contractor of such subcontractor potential claim.
- E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor potential claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor potential claims; (c) agree that, to the extent a subcontractor potential claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor potential claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor potential claims between the subcontractor(s) or supplier(s) and the Contractor that are not actionable by the Contractor against the Department.

DISPUTE REVIEW BOARD AGREEMENT

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

DISPUTE REVIEW BOARD AGREEMENT

(Contract Identification)

Contract No. _____

THIS DISPUTE REVIEW 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 Review Board, hereinafter called the "DRB" consisting of the following members:

_____,
(Contractor Appointee)

_____,
(State Appointee)

and _____
(Third Person)

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 special provisions 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;

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 resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

SECTION II SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

A. OBJECTIVE

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

B. PROCEDURES

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations 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. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The

recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during 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, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other 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.

C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS

The 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. 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 CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which 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 disputes and potential claims.

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.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

D. DRB CONSIDERATION AND HANDLING OF DISPUTES

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. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the

DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. 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 acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals 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 until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 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's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report 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.

With prior written approval of both parties, the DRB 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 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

E. DRB MEMBER REPLACEMENT

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

SECTION III CONTRACTOR RESPONSIBILITIES

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

SECTION IV STATE RESPONSIBILITIES

The STATE will furnish the following services and items:

A. CONTRACT RELATED DOCUMENTS

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

B. COORDINATION AND SERVICES

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

SECTION V TIME FOR BEGINNING AND COMPLETION

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

SECTION VI PAYMENT

A. ALL INCLUSIVE RATE PAYMENT

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates 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 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 parties will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

B. PAYMENTS

DRB members shall be compensated at the same rate. 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 STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The 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 CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

C. INSPECTION OF COSTS RECORDS

The DRB members 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 VII ASSIGNMENT OF TASKS OF WORK

The DRB members shall not assign the work of this AGREEMENT.

SECTION VIII TERMINATION OF DRB MEMBERS

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

SECTION IX LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, 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 X 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 the DRB. 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 shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION XI DISPUTES

Disputes between the parties hereto, including disputes between the DRB members and either party or both 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.

SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including an individual member of the DRB, 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 XIII 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.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE 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 MEMBER

By : _____

Title : _____

CONTRACTOR

CALIFORNIA STATE DEPARTMENT
OF TRANSPORTATION

By: _____

By: _____

Title: _____

Title: _____

5-1.13 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 in accordance with Section 9-1.03, "Force Account Payment," of the Standard Specifications and these special provisions.

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," in the Standard Specifications, shall not apply.

Attention is directed to "Time-Related Overhead" of these special provisions.

To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added the following markups:

| Cost | Percent Markup |
|------------------|----------------|
| Labor | 28 |
| 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 pursuant to "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in conformance with the provisions in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor.

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 8-1.01, "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.

5-1.14 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

The provisions of this section shall apply only to the following contract items:

| ITEM CODE | ITEM |
|-----------|------------------------------------|
| 390102 | ASPHALT CONCRETE (TYPE A) |
| 290201 | ASPHALT TREATED PERMEABLE BASE |
| 397001 | ASPHALTIC EMULSION (PAINT BINDER) |
| 390108 | ASPHALT CONCRETE BASE (TYPE A) |
| 374002 | ASPHALTIC EMULSION (FOG SEAL COAT) |

The compensation payable for asphalt concrete, asphalt concrete base, asphaltic emulsion (fog seal coat), asphaltic emulsion (paint binder) and asphalt treated permeable base will be increased or decreased in conformance with the provisions of this section for paving asphalt price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The quantity of paving asphalt used in asphaltic emulsion (fog seal coat) and asphaltic emulsion (paint binder) will be determined by multiplying the item quantity for asphaltic emulsion included in a monthly estimate by the minimum percent residue specified in Section 94, "Asphaltic Emulsions," of the Standard Specifications. The emulsion minimum percent residue obtained from Section 94, "Asphaltic Emulsions," of the Standard Specifications will be based on the type of emulsion used by the Contractor.

At the Contractor's option, the Contractor may provide actual daily test results for paving asphalt residue for the asphaltic emulsion used. Test results provided by the Contractor shall be from an independent testing laboratory that participates in the AASHTO Proficiency Sample Program. The Contractor shall take samples of asphaltic emulsion from the distributor truck at mid-load from a sampling tap or thief. Before samples are taken, 4 liters shall be drawn from the sampling devise and discarded. Two separate 2-liter samples shall be taken in the presence of the Engineer. The Contractor shall provide one sample to the Contractor's independent testing laboratory, within 24 hours of sampling. The second sample shall be given to the Engineer. The test results from the Contractor's independent testing laboratory shall be delivered to the Engineer within 10 days from sample date.

The adjustment in compensation will be determined in conformance with the following formulae when the item of asphalt concrete, asphalt concrete base, asphaltic emulsion (fog seal coat), asphaltic emulsion (paint binder) or asphalt treated permeable base is included in a monthly estimate:

- A. Total monthly adjustment = AQ
- B. For an increase in paving asphalt price index exceeding 10 percent:

$$A = 0.90 (1.1023) (Iu/Ib - 1.10) Ib$$

- C. For a decrease in paving asphalt price index exceeding 10 percent:

$$A = 0.90 (1.1023) (Iu/Ib - 0.90) Ib$$

- D. Where:

A = Adjustment in dollars per tonne of paving asphalt used to produce asphalt concrete, asphalt concrete base, asphaltic emulsion (paint binder) residue used as paint binder, asphaltic emulsion (fog seal coat) residual used as fog seal coat, and asphalt treated permeable base rounded to the nearest \$0.01.

Iu = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.

Ib = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.

Q = Quantity in tonnes of paving asphalt that was used in producing the quantity of asphalt concrete and asphalt concrete base shown under "This Estimate" on the monthly estimate using the amount of asphalt determined by the Engineer plus the quantity in tonnes of paving asphalt that would have been used in producing the quantity of asphalt treated permeable base shown under "This Estimate" on the monthly estimate using the amount of asphalt specified in the specifications plus the quantity in tonnes of paving asphalt that would have been used as residue in the asphaltic emulsion (paint binder) shown under "This Estimate" on the monthly estimate plus the quantity in tonnes of paving asphalt that would have been used as residual in the asphaltic emulsion (fog seal coat) shown under "Estimate" on the monthly estimate.

The adjustment in compensation will also be subject to the following:

- A. The compensation adjustments provided herein will be shown separately on payment estimates. The Contractor shall be liable to the State for decreased compensation adjustments and the Department may deduct the amount thereof from any moneys due or that may become due the Contractor.
- B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.
- C. In the event of an overrun of contract time, adjustment in compensation for paving asphalt included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is determined each month on the first business day of the month by the Department using the median of posted prices in effect as posted by Chevron, ExxonMobil, and Union 76 for the Buena Vista, Huntington Beach, and Midway Sunset fields.

In the event that the companies discontinue posting their prices for a field, the Department will determine an index from the remaining posted prices. The Department reserves the right to include in the index determination the posted prices of additional fields.

The California Statewide Paving Asphalt Price Index is available on the Division of Engineering Services website at:

http://www.dot.ca.gov/hq/esc/oe/asphalt_index/astable.html

5-1.15 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.

Areas available for the exclusive use of the Contractor are designated on the plans. 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 these areas.

The Contractor shall obtain encroachment permits prior to occupying State-owned parcels outside the contract limits. The required encroachment permits may be obtained from the Department of Transportation, Permit Engineer, Building 1, 4050 Taylor Street, San Diego, CA 92110.

Residence trailers will not be allowed within the highway right of way, except that one trailer will be allowed for yard security purposes.

The Contractor shall remove equipment, materials, and rubbish from the work areas and other State-owned property which the Contractor occupies. The Contractor shall leave the areas in a presentable condition in conformance with the provisions in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials or for other purposes, if sufficient area is not available to the Contractor within the contract limits, or at the sites designated on the plans outside the contract limits.

The Contractor shall not use State-owned property north of Station 242+40 "SD-15M" for plant sites, storage of equipment or materials, or otherwise occupy this area. When the Contractor performs work north of Station 242+40 "SD-15M" only the immediate work area may be occupied and only while construction activities are in progress.

After median construction activities are complete between Station 193+00 "15B" and Station 204+00 "ML", the Contractor shall not occupy this median area and shall remove all plant sites, equipment and material storage immediately.

5-1.16 PAYMENTS

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

| | |
|--------------------------------------------------------------------------------|--------------|
| A. Clearing and Grubbing | \$200,000.00 |
| B. Develop Water Supply | \$ 40,000.00 |
| C. Progress Schedule (Critical Path Method) | \$ 12,500.00 |
| D. Maintaining Existing Traffic Management System Elements During Construction | \$ 1,000.00 |

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

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. Metal sign structures
- B. Sign panels
- C. Culvert pipe and pipe arch and appurtenances
- D. Edge drain pipe
- E. Miscellaneous drainage facilities
- F. Railing and appurtenances
- G. Crash cushions
- H. Pavement markers
- I. Lighting fixtures
- J. Luminaires
- K. Signal and lighting standards
- L. Signal heads and lighting brackets
- M. Splice vaults
- N. Fiber optic cable
- O. Fiber optic conduit
- P. Fence
- Q. Miscellaneous iron and steel
- R. Plastic pipe (Irrigation systems)
- S. Soil nail assemblies
- T. Tieback anchors
- U. Bar reinforcing steel
- V. Miscellaneous bridge metal
- W. Prestressing steel for cast-in-place members (sealed packages only)
- X. Prestressing ducts and anchorages
- Y. Prestressing rods

5-1.17 PROJECT INFORMATION

The information in this section has been compiled specifically for this project and is made available for bidders and Contractors. Other information referenced in the Standard Specifications and these special provisions do not appear in this section. The information is subject to the conditions and limitations set forth in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," and Section 6-2, "Local Materials," of the Standard Specifications. Bidders and Contractors shall be responsible for knowing the procedures for obtaining information.

Information attached to the project plans is as follows:

- A. Log of Test Borings.

Information included in the Information Handout provided to bidders and contractors is as follows:

- A. Water Source Information, City of San Diego letter dated April 20, 2007.
- B. Final Structures Foundation Report dated March 22, 2007 for Bridges Nos. 57-0909 and 57-E0059.
- C. Revised Geotechnical Design Report dated August 3, 2007 for I-15/SR163 Separation Retaining Walls.
- D. Revised Geotechnical Design Report dated August 3, 2007 for Ammo Road OC Retaining Walls.
- E. Marine Corps Air Station Miramar memo Dated October 3, 2006.
- F. Marine Corps Air Station Miramar memo Dated November 7, 2006.
- G. Marine Corps Air Station Miramar memo Dated April 17, 2007.
- H. HOV Toll Booth, Installation Details.
- I. United States Fish and Wildlife Service - Biological Opinion Dated May 8, 2001.
- J. United States Fish and Wildlife Service - Biological Opinion Dated January 16, 2003.
- K. District Materials Information Brochure.
- L. Temporary Water Pollution Control Exhibit

Information available for inspection at the District Office is as follows:

- A. Cross Sections.

Cross sections are available in electronic copy.

The District Office in which the work is situated is located at 4050 Taylor Street, San Diego, CA 92110.

Plans of the existing bridges may be requested by fax from the Office of Structure Maintenance and Investigations, 1801 30th Street, Sacramento, CA, Fax (916) 227-8357, and are available at the Office of Structure Maintenance and Investigations, Los Angeles, CA, Telephone (213) 897-0877.

Plans of the existing bridges available to bidders and Contractors are reproductions of the original contract plans, with significant changes noted, and working drawings, and do not necessarily show normal construction tolerances and variances. Where dimensions of new construction required by this contract are dependent on the dimensions of the existing bridges, the Contractor shall verify the controlling field dimensions and shall be responsible for adjusting dimensions of the work to fit existing conditions.

5-1.18 SOUND CONTROL REQUIREMENTS

Sound control shall conform to the provisions in Section 7-1.01I, "Sound Control Requirements," of the Standard Specifications and these special provisions.

The noise level from the Contractor's operations, between the hours of 7:00 p.m. and 7:00 a.m., shall not exceed 86 dbA at a distance of 15 m. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level outside the limits of the State right of way.

The noise level requirement specified herein shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

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

5-1.19 UNEXPLODED ORDNANCE

This project goes through an area that was used as an artillery range, prior to 1950. If the Contractor encounters unexploded ordnance during construction, all work shall be suspended immediately and the Engineer and California Highway Patrol notified immediately. The Contractor shall notify the California Highway Patrol, San Diego, CA. telephone number (858) 637-3800.

Attention is directed to Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

At no time shall the Contractor's personnel disturb or approach found ordnances.

Work shall not be resumed until ordered, in writing, by the Engineer.

5-1.20 UNITED STATES MARINE CORPS AIR STATION REQUIREMENTS

This project is located near the United States Marine Corps Air Station Miramar. The work shall be performed in conformance with State laws and with the regulations of the United States Marine Corps relative to the safe performance of their airfield operations at Miramar Air Station.

Attention is directed to "Project Information" of these special provisions regarding MCAS Miramar requirements and procedures to be implemented in the vicinity of their airfield operations.

One week prior to commencing any proposed drilling in the vicinity of Ammo Overcrossing, the Contractor shall notify the MCAS Operations Duty Officer at phone number: (858) 577-4277. At the start of each workday, the drilling team supervisor shall provide a cell phone number to the Operations Duty Officer.

A checkerboard flag marker shall be attached to the drill rig in accordance with NAVAIR 51-50AAA-2, WP 003-09. At the conclusion of each workday the drill rig(s) shall be lowered.

During evening or nighttime drilling operations, double steady burning red lights shall be provided and operated in conformance with NAVAIR 51-50AAA-2, WP 003-10. All lighting, including temporary lighting, shall be directed down and away from the approach path.

Full compensation for conforming to the provisions in this section shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

5-1.21 UNITED STATES FISH AND WILDLIFE SERVICE REQUIREMENTS

The United States Fish and Wildlife Service (USFWS) has issued two Biological Opinions to the Department for project areas located within the jurisdiction of the USFWS. The Contractor shall be fully informed of the requirements and all rules, regulations, and conditions that may govern the Contractor's operations in these areas and shall conduct the work accordingly.

Attention is directed to "Project Information" of these special provisions regarding environmental permits, agreements or additional information.

Modifications to the Biological Opinions issued to the Department and the USFWS that are proposed by the Contractor shall be submitted in writing to the Engineer for consideration for transmittal to the USFWS for their consideration.

No work shall be performed which is inconsistent with the two original Biological Opinions or proposed modification prior to receiving written approval from the Engineer. Compensation for delay will be determined in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Modifications to the two Biological Opinions between the Department and the USFWS shall be fully binding on the Contractor.

The provisions of this section and approved modifications shall be made a part of every subcontract executed pursuant to this contract.

5-1.22 RELATIONS WITH CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

This project lies within the boundaries of the San Diego 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, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254, and may also be obtained at:

<http://www.swrcb.ca.gov/stormwtr/caltrans.html>

The Department's permit references and incorporates by reference the current statewide general permit issued by the SWRCB entitled "Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity" that regulates discharges of storm water and non-storm water from construction activities disturbing 0.4-hectare or more of soil in a common plan of development. Sampling and analysis requirements as specified in SWRCB Resolution No. 2001-46 are added to the statewide general permit. Copies of the statewide permit and modifications thereto are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254 and may also be obtained at:

<http://www.swrcb.ca.gov/stormwtr/construction.html>

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," 7-1.11, "Preservation of Property," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The Contractor shall be responsible for penalties assessed on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in "Water Pollution Control" of these special provisions or with the applicable provisions of the Federal, State, and local regulations and requirements.

Penalties as used in this section shall include fines, penalties, and damages, whether proposed, assessed, or levied against the Department or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

WITHHOLDS

The Department will withhold money due the Contractor, in an amount estimated by the Department, to include the full amount of penalties and mitigation costs proposed, assessed, or levied as a result of the Contractor's violation of the permits, or Federal or State law, regulations, or requirements. Funds will be withheld by the Department until final disposition of these costs has been made. The Contractor shall remain liable for the full amount until the potential liability is finally resolved with the entity seeking the penalties. Instead of the withhold, the Contractor may provide a suitable bond in favor of the Department to cover the highest estimated liability for any disputed penalties proposed as a result of the Contractor's violation of the permits, law, regulations, or requirements.

If a regulatory agency identifies a failure to comply with the permits and modifications thereto, or other Federal, State, or local requirements, the Department will withhold money due the Contractor, subject to the following:

- A. The Department will give the Contractor 30 days notice of the Department's intention to withhold funds from payments which may become due to the Contractor before acceptance of the contract. Funds withheld after acceptance of the contract will be made without prior notice to the Contractor.
- B. No withholds of additional amounts out of payments will be made if the amount to be withheld does not exceed the amount being withheld from partial payments in accordance with Section 9-1.06, "Partial Payments," of the Standard Specifications.
- C. If the Department has withheld funds and it is subsequently determined that the State is not subject to the entire amount of the costs and liabilities assessed or proposed in connection with the matter for which the withhold was made, the Department will return the excess amount withheld to the Contractor in the progress payment following the determination. If the matter is resolved for less than the amount withheld, the Department will pay interest at a rate of 6 percent per year on the excess withhold.

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.

5-1.23 MIGRATORY BIRDS

Attention is directed to the Federal Migratory Bird Treaty Act (16 USC 703 et seq.) Title 50 Code of Federal Regulations Part 10, and the California Department of Fish and Game Code Sections 3503, 3513, and 3800, that protect migratory birds, their occupied nests, and their eggs from destruction or take.

A Biologist will be provided by the State for this project. The Biologist will verify the presence or absence of migratory birds.

Attention is directed to "Order of Work" and "Clearing and Grubbing" of these special provisions.

Prior to the migratory bird nesting season of February 15 through September 1, vegetation mowing and tree removal within the limits of clearing and grubbing work shall be completed in conformance with the provisions in "Clearing and Grubbing" of these special provisions.

If evidence of bird nesting is discovered during the nesting season, the Contractor shall not disturb the nesting birds or nests, and shall immediately stop work adjacent to the nesting birds and notify the Engineer. During the nesting season migratory birds shall be handled as follows:

The Contractor shall place temporary noise barriers when determined by the Biologist and directed by the Engineer to minimize impacts to nesting migratory birds when discovered within the project limits. Placing temporary noise barriers to minimize impacts to nesting migratory birds when directed by the Engineer will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

If nesting migratory birds are found within the project limits where exclusion or noise mitigation is not feasible, the nesting area shall be designated as an environmentally sensitive area and no work shall occur within 20 meters until the nesting season is over.

The boundaries of the environmentally sensitive areas for migratory birds shall be delineated in conformance with "Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Once the nesting season is over, the areas will no longer be considered an environmentally sensitive area and temporary fence (Type ESA) shall be removed.

Temporary fence (Type ESA), when required to delineate the boundaries of the environmentally sensitive areas for migratory birds, will be measured and paid for in conformance with "Temporary Fence (Type ESA)" of these special provisions.

A delay due to migratory birds or their nests, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Attention is directed to "Time Related Overhead" of these special provisions.

5-1.24 PALEONTOLOGY

Attention is directed to the California Public Resources Code Section 5097.5, which protects vertebrate paleontological sites or other paleontological features situated on public lands. In compliance with the California Environmental Quality Act (CEQA) requirements a Paleontologist will monitor the excavation within the project limits to salvage fossil specimens as necessary during construction within the project limits.

A Paleontologist will be provided by the State for this project.

The Contractor shall provide the Engineer with a schedule of excavation operations within the project limits in writing at least 15 working days prior to construction and update the schedule as needed. The Contractor shall notify the Engineer 15 days in advance of the start of excavation operations.

If fossils are discovered, the Engineer may temporarily divert or suspend the excavation operations until the Paleontologist completes the salvage and removal of the fossil specimens.

All fossil specimens salvaged from within the State Right of Way shall remain the property of the State.

A delay due to paleontological monitoring or the salvage and removal of fossil specimens, when ordered by the Engineer, will be considered a temporary suspension of work, in accordance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

Any additional excavation required due to the discovery of paleontological remains, when ordered by the Engineer will be paid for as extra work as provided in Section 4-1.03, "Extra Work," of the Standard Specifications.

5-1.25 ENVIRONMENTALLY SENSITIVE AREA

An environmentally sensitive area (ESA) shall consist of an area within and near the limits of construction where access is prohibited or limited for the preservation of archeological site or existing vegetation, or protection of biological habitat as shown on the plans. The Engineer will determine the exact location of the boundaries of the ESA. No work shall be conducted within the ESA.

Attention is directed to Section 7—1.01 "Laws to be Observed," and Section 7—1.04 "Permits and Licenses," of the Standard Specifications regarding State and Federal regulations, permits, or agreements which pertain to an ESA.

Any lighting used during construction shall be shielded and directed away from adjacent ESA.

Attention is directed to "Migratory Birds" of these special provisions.

Prior to beginning work, the boundaries of the ESA shall be clearly delineated by the placement of temporary fence (Type ESA).

Vehicle access, storage or transport of materials or equipment, or other project related activities are prohibited within the boundaries of ESA.

The Contractor shall mitigate damage or impacts to the ESA caused by the Contractor's operations, at the Contractor's expense. If the Engineer determines mitigation work will be performed by others, or if mitigation fees are assessed the Department, deductions from moneys due or to become due the Contractor will be made for the mitigation costs.

5-1.26 PRESERVATION OF PROPERTY

Attention is directed to Section 7-1.11, "Preservation of Property," of the Standard Specifications and these special provisions.

Existing trees, shrubs and other plants, that are not to be removed as shown on the plans or specified in these special provisions, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be 600 mm box and the minimum size of shrub replacement shall be No. 15 container. Replacement ground cover plants shall be from flats and shall be planted 300 mm on center. Replacement of Carpobrotus ground cover plants shall be from cuttings and shall be planted 300 mm on center. Replacement planting shall conform to the requirements in Section 20-4.07, "Replacement," of the Standard Specifications. The Contractor shall water replacement plants in conformance with the provisions in Section 20-4.06, "Watering," of the Standard Specifications.

Damaged or injured plants 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. At the option of the Contractor, removed trees and shrubs may be reduced to chips. The chipped material shall be spread within the highway right of way at locations designated by the Engineer.

Replacement planting of injured or damaged trees, shrubs and other plants shall be completed not less than 20 working days prior to acceptance of the contract. Replacement plants shall be watered as necessary to maintain the plants in a healthy condition.

SECTION 6. (BLANK)

SECTION 7. (BLANK)

SECTION 8. MATERIALS

SECTION 8-1. MISCELLANEOUS

8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the United States Standard Measures which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

- A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
- B. Before other non-metric materials and products will be considered for use, the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.
- C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details, the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The plans and working drawings shall be submitted at least 7 days before the Contractor intends to begin the work involved.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT

ASTM Designation: A 82

| METRIC SIZE SHOWN ON THE PLANS
mm ² | SIZE TO BE SUBSTITUTED
inch ² x 100 |
|---------------------------------------------------|---------------------------------------------------|
| MW9 | W1.4 |
| MW10 | W1.6 |
| MW13 | W2.0 |
| MW15 | W2.3 |
| MW19 | W2.9 |
| MW20 | W3.1 |
| MW22 | W3.5 |
| MW25 | W3.9, except W3.5 in piles only |
| MW26 | W4.0 |
| MW30 | W4.7 |
| MW32 | W5.0 |
| MW35 | W5.4 |
| MW40 | W6.2 |
| MW45 | W6.5 |
| MW50 | W7.8 |
| MW55 | W8.5, except W8.0 in piles only |
| MW60 | W9.3 |
| MW70 | W10.9, except W11.0 in piles only |
| MW80 | W12.4 |
| MW90 | W14.0 |
| MW100 | W15.5 |

SUBSTITUTION TABLE FOR BAR REINFORCEMENT

| METRIC BAR DESIGNATION
NUMBER ¹ SHOWN ON THE PLANS | BAR DESIGNATION
NUMBER ² TO BE SUBSTITUTED |
|------------------------------------------------------------------|----------------------------------------------------------|
| 10 | 3 |
| 13 | 4 |
| 16 | 5 |
| 19 | 6 |
| 22 | 7 |
| 25 | 8 |
| 29 | 9 |
| 32 | 10 |
| 36 | 11 |
| 43 | 14 |
| 57 | 18 |

¹Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

²Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars.

No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.

SUBSTITUTION TABLE FOR SIZES OF:

- (1) STEEL FASTENERS FOR GENERAL APPLICATIONS (ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55), and
 (2) HIGH STRENGTH STEEL FASTENERS (ASTM Designation: A 325 or A 449)

| METRIC SIZE SHOWN ON THE PLANS
mm | SIZE TO BE SUBSTITUTED
inch |
|--------------------------------------|--------------------------------|
| 6 or 6.35 | 1/4 |
| 8 or 7.94 | 5/16 |
| 10 or 9.52 | 3/8 |
| 11 or 11.11 | 7/16 |
| 13, 12.70, or M12 | 1/2 |
| 14 or 14.29 | 9/16 |
| 16, 15.88, or M16 | 5/8 |
| 19, 19.05, or M20 | 3/4 |
| 22, 22.22, or M22 | 7/8 |
| 24, 25, 25.40, or M24 | 1 |
| 29, 28.58, or M27 | 1-1/8 |
| 32, 31.75, or M30 | 1-1/4 |
| 35 or 34.93 | 1-3/8 |
| 38, 38.10, or M36 | 1-1/2 |
| 44 or 44.45 | 1-3/4 |
| 51 or 50.80 | 2 |
| 57 or 57.15 | 2-1/4 |
| 64 or 63.50 | 2-1/2 |
| 70 or 69.85 | 2-3/4 |
| 76 or 76.20 | 3 |
| 83 or 82.55 | 3-1/4 |
| 89 or 88.90 | 3-1/2 |
| 95 or 95.25 | 3-3/4 |
| 102 or 101.60 | 4 |

SUBSTITUTION TABLE FOR NOMINAL THICKNESS OF SHEET METAL

| UNCOATED HOT AND COLD ROLLED SHEETS | | HOT-DIPPED ZINC COATED SHEETS
(GALVANIZED) | |
|----------------------------------------------|-----------------------------------|-----------------------------------------------|-----------------------------------|
| METRIC THICKNESS
SHOWN ON THE PLANS
mm | GAGE TO BE
SUBSTITUTED
inch | METRIC THICKNESS
SHOWN ON THE PLANS
mm | GAGE TO BE
SUBSTITUTED
inch |
| 7.94 | 0.3125 | 4.270 | 0.1681 |
| 6.07 | 0.2391 | 3.891 | 0.1532 |
| 5.69 | 0.2242 | 3.510 | 0.1382 |
| 5.31 | 0.2092 | 3.132 | 0.1233 |
| 4.94 | 0.1943 | 2.753 | 0.1084 |
| 4.55 | 0.1793 | 2.372 | 0.0934 |
| 4.18 | 0.1644 | 1.994 | 0.0785 |
| 3.80 | 0.1495 | 1.803 | 0.0710 |
| 3.42 | 0.1345 | 1.613 | 0.0635 |
| 3.04 | 0.1196 | 1.461 | 0.0575 |
| 2.66 | 0.1046 | 1.311 | 0.0516 |
| 2.28 | 0.0897 | 1.158 | 0.0456 |
| 1.90 | 0.0747 | 1.006 or 1.016 | 0.0396 |
| 1.71 | 0.0673 | 0.930 | 0.0366 |
| 1.52 | 0.0598 | 0.853 | 0.0336 |
| 1.37 | 0.0538 | 0.777 | 0.0306 |
| 1.21 | 0.0478 | 0.701 | 0.0276 |
| 1.06 | 0.0418 | 0.627 | 0.0247 |
| 0.91 | 0.0359 | 0.551 | 0.0217 |
| 0.84 | 0.0329 | 0.513 | 0.0202 |
| 0.76 | 0.0299 | 0.475 | 0.0187 |
| 0.68 | 0.0269 | ----- | ----- |
| 0.61 | 0.0239 | ----- | ----- |
| 0.53 | 0.0209 | ----- | ----- |
| 0.45 | 0.0179 | ----- | ----- |
| 0.42 | 0.0164 | ----- | ----- |
| 0.38 | 0.0149 | ----- | ----- |

SUBSTITUTION TABLE FOR WIRE

| METRIC THICKNESS
SHOWN ON THE PLANS
mm | WIRE THICKNESS
TO BE SUBSTITUTED
inch | GAGE NO. |
|----------------------------------------------|---------------------------------------------|----------|
| 6.20 | 0.244 | 3 |
| 5.72 | 0.225 | 4 |
| 5.26 | 0.207 | 5 |
| 4.88 | 0.192 | 6 |
| 4.50 | 0.177 | 7 |
| 4.11 | 0.162 | 8 |
| 3.76 | 0.148 | 9 |
| 3.43 | 0.135 | 10 |
| 3.05 | 0.120 | 11 |
| 2.69 | 0.106 | 12 |
| 2.34 | 0.092 | 13 |
| 2.03 | 0.080 | 14 |
| 1.83 | 0.072 | 15 |
| 1.57 | 0.062 | 16 |
| 1.37 | 0.054 | 17 |
| 1.22 | 0.048 | 18 |
| 1.04 | 0.041 | 19 |
| 0.89 | 0.035 | 20 |

SUBSTITUTION TABLE FOR PIPE PILES

| METRIC SIZE
SHOWN ON THE PLANS
mm x mm | SIZE
TO BE SUBSTITUTED
inch x inch |
|----------------------------------------------|------------------------------------------|
| PP 360 x 4.55 | NPS 14 x 0.179 |
| PP 360 x 6.35 | NPS 14 x 0.250 |
| PP 360 x 9.53 | NPS 14 x 0.375 |
| PP 360 x 11.12 | NPS 14 x 0.438 |
| PP 406 x 12.70 | NPS 16 x 0.500 |
| PP 460 x T | NPS 18 x T" |
| PP 508 x T | NPS 20 x T" |
| PP 559 x T | NPS 22 x T" |
| PP 610 x T | NPS 24 x T" |
| PP 660 x T | NPS 26 x T" |
| PP 711 x T | NPS 28 x T" |
| PP 762 x T | NPS 30 x T" |
| PP 813 x T | NPS 32 x T" |
| PP 864 x T | NPS 34 x T" |
| PP 914 x T | NPS 36 x T" |
| PP 965 x T | NPS 38 x T" |
| PP 1016 x T | NPS 40 x T" |
| PP 1067 x T | NPS 42 x T" |
| PP 1118 x T | NPS 44 x T" |
| PP 1219 x T | NPS 48 x T" |
| PP 1524 x T | NPS 60 x T" |

The thickness in millimeters (T) represents an exact conversion of the thickness in inches (T").

SUBSTITUTION TABLE FOR CIDH CONCRETE PILING

| METRIC SIZE
SHOWN ON THE PLANS | ACTUAL AUGER SIZE
TO BE SUBSTITUTED
inches |
|-----------------------------------|--------------------------------------------------|
| 350 mm | 14 |
| 400 mm | 16 |
| 450 mm | 18 |
| 600 mm | 24 |
| 750 mm | 30 |
| 900 mm | 36 |
| 1.0 m | 42 |
| 1.2 m | 48 |
| 1.5 m | 60 |
| 1.8 m | 72 |
| 2.1 m | 84 |
| 2.4 m | 96 |
| 2.7 m | 108 |
| 3.0 m | 120 |
| 3.3 m | 132 |
| 3.6 m | 144 |
| 4.0 m | 156 |
| | |
| | |
| | |
| | |

SUBSTITUTION TABLE FOR STRUCTURAL TIMBER AND LUMBER

| METRIC MINIMUM
DRESSED DRY,
SHOWN ON THE PLANS
mm x mm | METRIC MINIMUM
DRESSED GREEN,
SHOWN ON THE PLANS
mm x mm | NOMINAL
SIZE
TO BE SUBSTITUTED
inch x inch |
|-----------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|
| 19x89 | 20x90 | 1x4 |
| 38x89 | 40x90 | 2x4 |
| 64x89 | 65x90 | 3x4 |
| 89x89 | 90x90 | 4x4 |
| 140x140 | 143x143 | 6x6 |
| 140x184 | 143x190 | 6x8 |
| 184x184 | 190x190 | 8x8 |
| 235x235 | 241x241 | 10x10 |
| 286x286 | 292x292 | 12x12 |

SUBSTITUTION TABLE FOR NAILS AND SPIKES

| METRIC COMMON NAIL,
SHOWN ON THE PLANS | METRIC BOX NAIL,
SHOWN ON THE PLANS | METRIC SPIKE,
SHOWN ON THE
PLANS | SIZE
TO BE
SUBSTITUTED
Penny-weight |
|-------------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------------|
| Length, mm
Diameter, mm | Length, mm
Diameter, mm | Length, mm
Diameter, mm | |
| 50.80
2.87 | 50.80
2.51 | ————— | 6d |
| 63.50
3.33 | 63.50
2.87 | ————— | 8d |
| 76.20
3.76 | 76.20
3.25 | 76.20
4.88 | 10d |
| 82.55
3.76 | 82.55
3.25 | 82.55
4.88 | 12d |
| 88.90
4.11 | 88.90
3.43 | 88.90
5.26 | 16d |
| 101.60
4.88 | 101.60
3.76 | 101.60
5.72 | 20d |
| 114.30
5.26 | 114.30
3.76 | 114.30
6.20 | 30d |
| 127.00
5.72 | 127.00
4.11 | 127.00
6.68 | 40d |
| ————— | ————— | 139.70
7.19 | 50d |
| ————— | ————— | 152.40
7.19 | 60d |

SUBSTITUTION TABLE FOR IRRIGATION
COMPONENTS

| METRIC
WATER METERS, TRUCK
LOADING STANDPIPES,
VALVES, BACKFLOW
PREVENTERS, FLOW
SENSORS, WYE
STRAINERS, FILTER
ASSEMBLY UNITS, PIPE
SUPPLY LINES, AND PIPE
IRRIGATION SUPPLY
LINES
SHOWN ON THE PLANS
DIAMETER NOMINAL (DN)
mm | NOMINAL
SIZE
TO BE SUBSTITUTED

inch |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 15 | 1/2 |
| 20 | 3/4 |
| 25 | 1 |
| 32 | 1-1/4 |
| 40 | 1-1/2 |
| 50 | 2 |
| 65 | 2-1/2 |
| 75 | 3 |
| 100 | 4 |
| 150 | 6 |
| 200 | 8 |
| 250 | 10 |
| 300 | 12 |
| 350 | 14 |
| 400 | 16 |

Unless otherwise specified, substitutions of United States Standard Measures standard structural shapes corresponding to the metric designations shown on the plans and in conformance with the requirements in ASTM Designation: A 6/A 6M, Annex 2, will be allowed.

8-1.02 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)

1. Apex, Model 921AR (100 mm x 100 mm)
2. Ennis Paint, Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and 953 (70 mm x 114 mm)
3. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm)
4. 3M Series 290 (89 mm x 100 mm)
5. 3M Series 290 PSA, with pressure sensitive adhesive pad (89 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

(for recessed applications only)

1. Ennis Paint, Model 948 (58 mm x 119 mm)
 2. Ennis Paint, Model 944SB (51 mm x 100 mm)*
 3. Ray-O-Lite, Model 2002 (51 mm x 117 mm)
 4. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)*
- *For use only in 114 mm wide (older) recessed slots

Non-Reflective, 100-mm Round

1. Apex Universal (Ceramic)
2. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
3. Glowlite, Inc. (Ceramic)
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)

PAVEMENT MARKERS, TEMPORARY TYPE

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

1. Vega Molded Products "Temporary Road Marker" (75 mm x 100 mm)

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. Filtrona Extrusion, 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 5730
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
3. Garlock Rubber Technologies, Series 2000
4. P.B. Laminations, Aztec, Grade 102
5. Swarco Industries, "Director-2"
6. Trelleborg Industries, R140 Series
7. 3M Series 620 "CR", and Series A750
8. 3M Series A145, Removable Black Line Mask

- (Black Tape: for use only on Asphalt Concrete Surfaces)
9. Advanced Traffic Marking Black "Hide-A-Line"
(Black Tape: for use only on Asphalt Concrete Surfaces)
 10. Brite-Line "BTR" Black Removable Tape
(Black Tape: for use only on Asphalt Concrete Surfaces)
 11. Trelleborg Industries, RB-140
(Black Tape: for use only on Asphalt Concrete Surfaces)

Preformed Thermoplastic (Heated in place)

1. Flint Trading Inc., "Hot Tape"
2. Flint Trading Inc., "Premark Plus"
3. Ennis Paint Inc., "Flametape"

Ceramic Surfacing Laminate, 150 mm x 150 mm

1. Highway Ceramics, Inc.

CLASS 1 DELINEATORS

One Piece Driveable Flexible Type, 1700-mm

1. Filtrona Extrusion, "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, 1700-mm

1. Filtrona Extrusion, Model FG 560 (with 450-mm U-Channel base)
2. Carsonite, "Survivor" (with 450-mm U-Channel base)
3. Carsonite, Roadmarker CRM-375 (with 450-mm U-Channel base)
4. FlexStake, Model 604
5. GreenLine Model CGD (with 450-mm U-Channel base)
6. Impact Recovery Model D36, with #105 Driveable Base
7. Safe-Hit with 200-mm pavement anchor (SH248-GP1)
8. Safe-Hit with 380-mm soil anchor (SH248-GP2) and with 450-mm soil anchor (SH248-GP3)

Surface Mount Type, 1200-mm

1. Bent Manufacturing Company, Masterflex Model MF-180EX-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

CHANNELIZERS

Surface Mount Type, 900-mm

1. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
2. Filtrona Extrusion, 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
10. Three D Traffic Works "Boomerang" ID No. 522053W

Lane Separation System

1. Filtrona Extrusion, "Flexi-Guide (FG) 300 Curb System"
2. Qwick Kurb, "Klemmfix Guide System"
3. Dura-Curb System

CONICAL DELINEATORS, 1070-mm

(For 700-mm Traffic Cones, see Standard Specifications)

1. Bent Manufacturing Company "T-Top"
2. Plastic Safety Systems "Navigator-1070 mm"
3. Traffix Devices "Grabber"
4. Three D Traffic Works "Ringtop" TD7000, ID No. 742143
5. Three D Traffic Works, TD7500

OBJECT MARKERS

Type "K", 450-mm

1. Filtrona Extrusion, Model FG318PE
2. Carsonite, Model SMD 615
3. FlexStake, Model 701 KM
4. Safe-Hit, Model SH718SMA

Type "K-4" / "Q" Object Markers, 600-mm

1. Bent Manufacturing "Masterflex" Model MF-360-24
2. Filtrona Extrusion, 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

CONCRETE BARRIER MARKERS AND TEMPORARY RAILING (TYPE K) REFLECTORS

Impactable Type

1. ARTUK, "FB"
2. Filtrona Extrusion, Models PCBM-12 and PCBM-T12
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 9304

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. Filtrona Extrusion, "Mini" (75 mm x 254 mm)
2. Creative Building Products, "Dura-Bull, Model 11201"
3. Duraflex Corp., "Railrider"
4. Plastic Vacuum Forming, "Cap-It C300"

CONCRETE BARRIER DELINEATORS, 400-mm

(For use to the right of traffic)

1. Filtrona Extrusion, Model PCBM T-16
2. Safe-Hit, Model SH216RBM

CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)

1. Stinson Equipment Company "SaddleMarker"

GUARD RAILING DELINEATOR

(Place top of reflective element at 1200 mm above plane of roadway)

Wood Post Type, 686-mm

1. Filtrona Extrusion, 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

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
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, 100-mm and 150-mm Sleeves

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

Drums

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

Barricades: 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

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

1. Avery Dennison, W-2100 Series

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

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 VII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

1. 3M Series 3924S, Fluorescent Orange
2. 3M LDP Series 3970

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

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" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)(PVC)

Aluminum Composite, Temporary Construction Signs Only

1. Alcan Composites "Dibond Material, 2 mm"
2. Mitsubishi Chemical America, Alpolic 350

8-1.03 STATE-FURNISHED MATERIALS

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications and these special provisions.

The following materials will be furnished to the Contractor:

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- A. Padlocks for walk gates.
- B. Model 170 controller assemblies, including controller unit, completely wired controller cabinet, battery back-up system (without batteries) and inductive loop detector sensor units.
- C. Self-adhesive numbers (with reflective sheet background) and edge sealer for numbering electrical equipment.

Completely wired controller cabinets, with auxiliary equipment but without controller unit, will be furnished to the Contractor at the District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, California 92111, telephone No. (858) 467-4010.

Loop detector sensor units will be furnished to the Contractor at the District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, California 92111, telephone No. (858) 467-4010.

Model 510 changeable message sign, wiring harness, and controller assembly, including the controller unit and completely wired cabinet, will be furnished to the Contractor at the District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, California 92111, telephone No. (858) 467-4010.

The Contractor shall notify the Engineer not less than 48 hours before State-furnished material is to be picked up by the Contractor. A full description of the material and the time the material will be picked up shall be provided.

8-1.04 SLAG AGGREGATE

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

- A. Structure backfill material.
- B. Pervious backfill material.
- C. Permeable material.
- D. Reinforced or prestressed portland cement concrete component or structure.
- E. Nonreinforced portland cement concrete component or structure for which a Class 1 Surface Finish is required by the provisions in Section 51-1.18B, "Class 1 Surface Finish," of the Standard Specifications.

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

- A. Imported Borrow.
- B. Aggregate Subbase.
- C. Class 2 Aggregate Base.
- D. Asphalt Concrete.

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 19-mm 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 mass 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 9075 tonnes nor more than 45 350 tonnes 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, 5900 Folsom Boulevard, Sacramento, California 95819, 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 mass 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 0.3-m, measured in any direction, of a non-cathodically protected pipe or structure unless the aggregate is incorporated in portland cement concrete pavement, in asphalt concrete, or in treated base.

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

Slag aggregate used for embankment construction shall not be placed within 0.46-m of finished slope lines, measured normal to the plane of the slope.

If steel slag aggregates are used to make asphalt concrete, there shall be no other aggregates used in the mixture, except that up to 50 percent of the material passing the 4.75-mm 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.

In addition to the requirements of Section 39-3.01, "Storage," of the Standard Specifications, 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.

Asphalt concrete 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 asphalt concrete, and if the specific gravity of a compacted stabilometer test specimen is in excess of 2.40, the quantity of asphalt concrete 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 asphalt concrete will be determined by multiplying the quantity of asphalt concrete 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.

8-1.05 ENGINEERING FABRICS

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

Filter fabric for this project shall be ultraviolet (UV) ray protected.

8-1.06 ASPHALTIC EMULSION

Asphaltic emulsion shall conform to the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications and these special provisions.

When tested in conformance with the "Residue and Oil Distillate by Distillation" test of AASHTO Designation: T 59, the composition of SS1 asphaltic emulsion shall be a minimum 57 percent of residue.

SECTION 8-2. CONCRETE

8-2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of supplementary cementitious material in the total amount of cementitious material to be used. A source of aggregate will be considered for addition to the approved list if the producer of the aggregate submits to the Transportation Laboratory certified test results from a qualified testing laboratory that verify the aggregate complies with the requirements. Before the testing starts, the aggregate test shall be registered with the Department. A registration number can be obtained by

calling (916) 227-7228. The registration number shall be used as the identification for the aggregate sample in correspondence with the Department. Upon request, a split of the tested sample shall be provided to the Department. Approval of aggregate will depend upon compliance with the specifications, based on the certified test results submitted, together with any replicate testing the Department may elect to perform. Approval will expire 3 years from the date the most recent registered and evaluated sample was collected from the aggregate source.

Qualified testing laboratories shall conform to the following requirements:

1. Laboratories performing ASTM Designation: C 1293 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Concrete Proficiency Sample Program and shall have received a score of 3 or better on each test of the previous 2 sets of concrete samples.
2. Laboratories performing ASTM Designation: C 1260 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Pozzolan Proficiency Sample Program and shall have received a score of 3 or better on the shrinkage and soundness tests of the previous 2 sets of pozzolan samples.

Aggregates on the list shall conform to one of the following requirements:

1. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1293, the average expansion at one year shall be less than or equal to 0.040 percent; or
2. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1260, the average of the expansion at 16 days shall be less than or equal to 0.15 percent.

If the aggregates used in the concrete are on the Department's list, the minimum amount of supplementary cementitious material shall conform to the following:

1. If fly ash or natural pozzolan conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 15 percent by mass of the total cementitious material; or
2. If silica fume conforming to the provisions in Section 90-2.01C, "Required Use of Supplementary Cementitious Materials," of the Standard Specifications is used, the minimum amount of supplementary cementitious material shall be 7 percent by mass of the total cementitious material.

The limitation on tricalcium silicate (C_3S) content in Type II cement specified in Section 90-2.01A, "Cement," of the Standard Specifications shall not apply.

8-2.02 CORROSION CONTROL FOR PORTLAND CEMENT CONCRETE

Portland cement concrete at Pomerado Road OC (Pony Bent) (Br. No. 57-0909), DS ML233 Modification, and Retaining Walls ML197R (Br. No. 57E0045), ML219L (Br. No. 57E0046), and Retaining Wall ML239R (Br. No. 57E0059) is considered to be in a corrosive environment and shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

Cementitious material to be used in portland cement concrete shall conform to the provisions for cement and mineral admixtures in Section 90-2, "Materials," of the Standard Specifications, and shall be a combination of either "Type II Modified" or Type V portland cement and mineral admixture.

Concrete in a corrosive environment shall contain not less than 400 kg of cementitious material per cubic meter.

No reduction in the cementitious material content specified or ordered, in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications, will be allowed for concrete in a corrosive environment.

Unless otherwise specified, for concrete in a corrosive environment, the amount of portland cement shall be 75 percent by mass, and the amount of supplementary cementitious material shall be 25 percent by mass, of the total amount of cementitious material to be used in the concrete mix.

The supplementary cementitious material for concrete in a corrosive environment shall be either flyash or natural pozzolan. At the option of the Contractor, this concrete may conform to A, B, C, or D below.

- A. 20 percent by mass of either flyash or natural pozzolan, 5 percent by mass of silica fume, and 75 percent by mass of portland cement.
- B. 10 percent by mass of silica fume and 90 percent by mass of portland cement.
- C. 50 percent by mass of ground granulated blast furnace slag, and 50 percent by mass of portland cement.
- D. 10 Percent by mass of metakaolin conforming to AASHTO Designation: M 295 Class N and 90 percent by mass of portland cement. Metakaolin shall also conform to the following chemical and physical requirements:

| Chemical Requirements | Percent |
|----------------------------------------------------------------------------------------|-----------|
| Silicon Dioxide (SiO ₂) + Aluminum Oxide (Al ₂ O 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 ₂ O) equivalent | 1.0 max. |

| Physical Requirements | Percent |
|----------------------------------------------|----------------------------|
| Retained No. 325 sieve | 2.0 max |
| Strength Activity Index with portland cement | |
| 7 days | 100 (minimum % of control) |
| 28 days | 100 (minimum % of control) |

The amount of free water used in concrete in a corrosive environment shall not exceed 160 kg/ m³, plus 40 kg for each 100 kg of cementitious material in excess of 400 kg/ m³.

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

8-2.03 CEMENTITIOUS MATERIAL AND AIR CONTENT

Except for concrete listed below, all concrete that is designated as Class 2 and all concrete for use in structures shall contain not less than 375 kg of cementitious material per cubic meter and shall be air entrained as provided in Section 90-4, "Admixtures," of the Standard Specifications. The air content at time of mixing and prior to placing shall be 3.0 ± 1.0 percent.

- A. Paving concrete.
- B. Concrete designated by 28-day compressive strength.
- C. Concrete specified to have a cementitious material content that exceeds 375 kilograms per cubic meter.
- D. Seal course concrete.
- E. Concrete for deck slabs of bridges and structure approach slabs.
- F. Concrete for piling.

SECTION 8-3. WELDING

8-3.01 WELDING

GENERAL

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.

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 | 2006 |
| D1.4 | 2005 |
| D1.5 | 2002 |
| D1.6 | 1999 |

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.

Section 6.1.1.1 of AWS D1.5 is replaced with the following:

Quality Control (QC) shall be the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing of each weld joint prior to welding, during welding, and after welding as specified in this section and as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

Unless otherwise specified, Sections 6.1.3 through 6.1.4.3 of AWS D1.1, Section 7.1.2 of AWS D1.4, and Sections 6.1.1.2 through 6.1.3.3 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, and 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.

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

When any work is welded in conformance with the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications, not including Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications, Section 6.1.4 of AWS D1.1 is replaced with the following:

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship and shall be currently certified as an AWS CWI in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors," or as a Welding Inspector Specialist (WIS) in conformance with the requirements in AWS B5.2, "Specification for the Qualification of Welding Inspector Specialists and Welding Inspector Assistants."

Section 6.14.6, "Personnel Qualification," of AWS D1.1, Section 7.8, "Personnel Qualification," of AWS D1.4, and Section 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.

Section 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 Sections 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.

Section 6.6.5, "Nonspecified NDT Other than Visual," of AWS D1.1, Section 7.6.5 of AWS D1.4 and Section 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.

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.

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.

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.

In addition to the requirements of AWS D1.1, welding procedures qualification for work welded in conformance with that code shall conform to the following requirements:

- A. The travel speed, amperage, and voltage values that are used for tests conducted per AWS D1.1, Section 4.1.1, 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. The travel speed shall in no case vary by more than ± 15 percent when using submerged arc welding.
- B. 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.

In addition to the requirements of AWS D1.5, Section 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 two 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, Section 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, Section 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 Section 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 Section 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 Section 5.12 or 5.13.
- E. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Section 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 75 mm in width and shall remain in place during NDT testing. Results of the visual and radiographic tests shall comply with AWS D1.5 Section 6.26.2, excluding Section 6.26.2.2. Test plates that do not comply with both tests shall not be used.

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 when any work is welded in conformance with the provisions in Section 49, "Piling," Section 52, "Reinforcement," Section 55, "Steel Structures," or Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications.

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

<http://www.dot.ca.gov/hq/esc/Translab/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.

When joint weld details that are not prequalified to the details of Section 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 2 weeks to complete the review of the proposed joint detail locations. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. 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 460 mm. 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. 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 2 weeks to review the qualifications and copy of the current certification of the independent third party. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. The Contractor shall notify the Engineer one week prior to performing any 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 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.

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. The welding is performed on pipe pile material at a permanent pipe manufacturing facility authorized to apply the American Petroleum Institute (API) monogram for API 5L pipe.

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.

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.

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 2 weeks 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. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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 one week 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. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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/smbresources.htm>

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.

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 2 weeks 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. Unless otherwise specified, the Engineer shall be allowed 2 weeks 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. Should the Contractor elect to wait to encase or cover welds pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

In addition to the requirements in AWS D1.1 and AWS D1.5, second-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 second-time repairs 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 one week to review these procedures. No remedial work shall begin until the repair procedures are approved in writing by the Engineer. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

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 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 which is certified under the AISC Quality Certification Program, Category Sbd, Conventional Steel Building Structures.

Welding Qualification Audit

Contractors or subcontractors performing welding operations for overhead sign and pole structures shall not deliver materials to the project without having successfully completed the Department's "Manufacturing Qualification Audit for Overhead Sign and Pole Structures," hereinafter referred to as the audit, not more than one year prior to the delivery of the materials. The Engineer will perform the audit. Copies of the audit form, and procedures for requesting and completing the audit, are available at the Transportation Laboratory or at: <http://www.dot.ca.gov/hq/esc/Translab/smbresources.htm>

An audit that was approved by the Engineer no more than one year prior to the beginning of work on this 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.

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 bridges and retaining walls as shown on the plans and briefly described as follows:

Pomerado Road Overcrossing (Pony Bent) (Bridge No. 57-0909)

A single-span cast-in-place prestressed concrete box girder structure supported on spread footings.

DS ML233 Modification

Modification of a pedestrian box culvert ventilation shaft opening.

Retaining Wall ML197R

Br. No. 57E0045

A soil nail and tieback anchor retaining wall approximately 140 meters long.

Retaining Wall ML219L

Br. No. 57E0046

A soil nail and tieback anchor retaining wall approximately 45.4 meters long.

Retaining Wall ML239R

Br. No. 57E0059

A shotcrete and cast-in-place tieback and Type 1 concrete retaining wall.

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 two 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, 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:

STATE HIGHWAY FUNDS

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

HIGHWAY CONSTRUCTION

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.

Removal of the HOV toll booth and overhead sign structures at Station 230+52 "ML" Line shall not occur until after March 2, 2009.

Relocate HOV pop-up control system shall be completed prior to constructing the retaining walls "ML197R" and "ML 202R".

Recycled water service through the 250 mm main irrigation supply line shall not be interrupted for more than seven consecutive calendar days.

Once work on the "DS ML233" at Station 232+40 Lt of the "ML" Line has begun, the Contractor shall complete the work within 19 consecutive days. No work is permitted in the "DS ML233" from sunrise Saturday to sunset Sunday of each weekend.

Prior to starting work on the "DS ML233" the Contractor shall install the temporary gate as shown on the plans. From sunrise Saturday to sunset Sunday of each weekend the Contractor shall provide safe access for riders.

Attention is directed to "Paleontology" of these special provisions regarding possible suspension of work for removal and salvage of fossils during excavation operations.

Attention is directed to "Migratory Birds" and "Clearing and Grubbing" of these special provisions regarding notification requirements and time constraints for performing work.

Prior to the initiation of earthwork operations, temporary construction entrances shall be installed. Attention is directed to "Temporary Construction Entrance" of these special provisions.

Temporary concrete washout facility shall be in place prior to the start of any concrete work. Attention is directed to "Temporary Concrete Washout Facility" of these special provisions.

Application of temporary hydraulic mulch, temporary hydraulic mulch (Bonded Fiber Matrix), erosion control (Type D, Hydraulic Matrix, and Biofiltration), and compost, incorporate, may require several move-in/move-outs (Temporary Erosion Control or Erosion Control) of erosion control equipment. Attention is directed to "Move-In/Move-Out (Temporary Erosion Control)" and to "Move-In/Move-Out (Erosion Control)" of these special provisions.

Attention is directed to "Temporary Lighting", "Temporary Traffic Monitoring Stations" and "Temporary Communication Systems". Before any of these systems are disturbed by the contractor's operations, temporary electrical systems shall be installed. Temporary traffic monitoring stations shall be calibrated and all temporary electrical system shall be operational.

Temporary communication system south of 15/163 separation shall be complete and fully operational as shown on the plans prior to stage 1 operations.

Fiber optic communication system north of station 224+40 shall be complete and operational prior to any work on stage 3.

Attention is directed to "Miscellaneous Concrete Construction" of these special provisions regarding constructing a 600 mm by 600 mm test panel prior to constructing curb ramps with detectable warning surfaces.

Attention is directed to "Architectural Surface (Textured Concrete)" of these special provisions regarding the construction of 1.25 m x 1.25 m test panel before beginning work on architectural textures.

Attention is directed to "Shotcrete" of these special provisions regarding preconstruction shotcrete test panels.

Temporary railing (Type K), traffic plastic drums and temporary crash cushions shall be secured in place prior to commencing work for which the temporary railing, traffic plastic drums and crash cushions are required.

Attention is directed to "Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Prior to beginning work, the boundaries of the Environmentally Sensitive Areas (ESA) shall be clearly delineated in the field. The boundaries shall be delineated by the installation of temporary fence (Type ESA).

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the Storm Water Pollution Prevention Plan prior to performing work having potential to cause water pollution.

The Contractor's attention is directed to the presence of Emergency Call Boxes within the limits of this project.

The Contractor shall notify the Engineer and the Operators of the facility 10 days prior to commencing work affecting access to the facilities in order to allow the removal or relocation of the emergency call boxes by the operator. The facility operators may be reached at the following:

| Facility Operator | Telephone Number |
|-------------------------------|------------------|
| TeleTran Tek Services | 1-858-279-1299 |
| Comarco Wireless Technologies | 1-858-268-8260 |

Ten days prior to the completion of the work, affecting access to the facilities, the Contractor shall notify the Engineer and Operator of the emergency call boxes. The Contractor shall provide access to the operator for the installation of the emergency call boxes.

If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with, the State will compensate the Contractor for such delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

As part of the first order of work the Contractor shall place the order for the traffic signal equipment. The Engineer shall be furnished a statement from the vendor that the order for the traffic signal equipment has been received and accepted by the vendor.

Prior to any stage construction work at a signalized intersection that shifts traffic to a new lane alignment, Video Image Vehicle Detection System (VIVDS) shall be installed and functioning. The Contractor shall be responsible to configure detection for each approach to any signalized intersection at any time traffic is moved to a new alignment.

Prior to any stage construction work on freeway lanes that shifts traffic to a new lane alignment, temporary traffic monitoring stations shall be installed and functioning. The contractor shall be responsible for configuration of the microwave vehicle detection system (MVDS) to sense vehicle presence and speed for all new lane alignments.

Loop detectors may be placed after the uppermost layer of new pavement has been placed.

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

Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location.

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

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

The work shall be performed in conformance with the stages of construction shown on the plans. The Contractor may submit a proposal to proceed with work in subsequent stages if the work does not conflict with work in preceding stages. This proposal must include:

1. Revised staging plans
2. Revised schedule, including revised staging, showing satisfactory progress is maintained in preceding stages
3. Statement of cost savings

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 asphalt concrete, 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 asphalt concrete has been placed. After completion of the paving 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 tonne for asphalt concrete (type A), and no additional compensation will be allowed therefor.

When traffic is moved from an established path to a new path and pavement delineation changes are required, all material and equipment needed for new delineation shall be at the site of the work before any shift of traffic is undertaken. The equipment shall be in good working condition.

At those locations exposed to public traffic where guard railings or barriers are to be constructed or removed, 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 applying seeds, furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor must include the names and quantity of seed ordered and the anticipated date of delivery.

The Engineer designates ground locations of erosion control by directing the placing of stakes or other suitable markers before application of erosion control materials as specified under "Erosion Control (Type D)," "Erosion Control (Biofiltration)," "Erosion Control (Hydraulic Matrix)," or "Compost, Incorporate" of these special provisions.

Locate existing irrigation water line crossovers and conduits before performing work on the irrigation system as specified under "Locate Existing Crossover and Conduits" of these special provisions.

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.

Do not perform clearing, grubbing, and earthwork operations in areas where existing irrigation facilities are to remain in place until existing irrigation facilities have been checked for proper operation as specified under "Existing Highway Irrigation Facilities" of these special provisions.

Locate existing conduits to be extended as specified under "Extend Irrigation Crossovers" of these special provisions before the start of other work in these areas.

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

Full compensation for conforming to the provisions in this section shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

10-1.02 WATER POLLUTION CONTROL

GENERAL

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, section of these special provisions entitled "Relations With California Regional Water Quality Control Board," and these special provisions.

The Contractor may obtain other National Pollutant Discharge Elimination System (NPDES) permits that apply to activities and mobile operations within or outside of the project limits including hot mix asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, or access roads.

The Contractor shall perform water pollution control work in conformance with the requirements in the "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual" and its addenda in effect on the day the Notice to Contractors is dated. This manual is referred to as the "Preparation Manual." Copies of the Preparation Manual may be obtained from:

State of California
Department of Transportation
Publication Distribution Unit
1900 Royal Oaks Drive
Sacramento, California 95815
Telephone: (916) 445-3520

Office of the Duty Senior for Construction
Department of Transportation
4050 Taylor Street
San Diego, California 92110
Telephone: (619) 688-6635

The Preparation Manual and other references for performing water pollution control work are available from the Department's Construction Storm Water and Water Pollution Control web site at:

<http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm>

Before the start of job site activities, the Contractor shall provide training for project managers, supervisory personnel, and employees involved with water pollution control work. The training shall include:

- A. Rules and regulations
- B. Implementation and maintenance for:
 - 1. Temporary Soil Stabilization
 - 2. Temporary Sediment Control
 - 3. Tracking Control
 - 4. Wind Erosion Control

The Contractor shall designate in writing a Water Pollution Control Manager (WPCM). The Contractor shall submit a statement of qualifications describing the training, work history, and expertise of the proposed WPCM. The qualifications shall include either:

- A. A minimum of 24 hours of Department approved storm water management training described at Department's Construction Storm Water and Water Pollution Control web site.
- B. Certification as a Certified Professional in Erosion and Sediment Control (CPESC).

The WPCM shall be:

- A. Responsible for water pollution control work.
- B. The primary contact for water pollution control work.
- C. Have authority to mobilize crews to make immediate repairs to water pollution control practices.

The Contractor may designate one manager to prepare the SWPPP and a different manager to implement the plan. The WPCP preparer shall meet the training requirements for the WPCM.

STORM WATER POLLUTION PREVENTION PLAN

The Contractor shall submit a Storm Water Pollution Prevention Plan (SWPPP) to the Engineer for approval. The SWPPP shall conform to the requirements in the Preparation Manual, the NPDES permit, and these special provisions. The SWPPP shall be submitted in place of the water pollution control program required by the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications.

The SWPPP shall include water pollution control practices:

- A. For storm water and non-storm water from areas outside of the job site related to construction activities for this contract such as:
 - 1. Staging areas.
 - 2. Storage yards.
 - 3. Access roads.
- B. Appropriate for each season as described in "Implementation Requirements" of these special provisions.
- C. For activities or mobile operations related to all NPDES permits.

The SWPPP shall include a schedule that:

- A. Describes when work activities that could cause water pollution will be performed.
- B. Identifies soil stabilization and sediment control practices for disturbed soil area.
- C. Includes dates when these practices will be 25, 50, and 100 percent complete.
- D. Shows 100 percent completion of these practices before the rainy season.

The SWPPP shall include the following temporary water pollution control practices and their associated contract items of work as shown on the plans or specified in these special provisions:

- A. Temporary Soil Stabilization
 - 1. Temporary Hydraulic Mulch
 - 2. Move-In/Move-Out (Temporary Erosion Control)
 - 3. Temporary Hydraulic Mulch (Bonded Fiber Matrix)
- B. Temporary Sediment Control
 - 1. Temporary Fiber Roll
 - 2. Temporary Check Dam
 - 3. Temporary Drainage Inlet Protection
- C. Tracking Control
 - 1. Temporary Construction Entrance
 - 1. Street Sweeping
- D. Wind Erosion Control
 - 1. Construction Site Management
- E. Non-Storm Water Management
 - 1. Construction Site Management
- F. Waste Management and Materials Pollution Control
 - 1. Construction Site Management
 - 2. Temporary Concrete Washout Facility

The SWPPP shall include the following contract items of work for permanent water pollution control as shown on the plans or as specified in these special provisions:

- A. Erosion Control (Type D)
- B. Erosion Control (Hydraulic Matrix)
- C. Compost, Incorporate
- D. Erosion Control (Biofiltration)
- E. Move-In/Move-Out (Erosion Control)
- F. Fiber Rolls

Within 20 days after contract approval, the Contractor shall submit 3 copies of the SWPPP to the Engineer. The Contractor shall allow 20 days for the Engineer's review. If revisions are required, the Engineer will provide comments and specify the date that the review stopped. The Contractor shall revise and resubmit the SWPPP within 15 days of receipt of the Engineer's comments. The Engineer's review will resume when the complete SWPPP is resubmitted. When the Engineer approves the SWPPP, the Contractor shall submit 4 copies of the approved SWPPP to the Engineer. The Contractor may proceed with construction activities if the Engineer conditionally approves the SWPPP while minor revisions are being completed. If the Engineer fails to complete the review within the time allowed and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay, the Contractor will be compensated for resulting losses, and an extension of time will be granted, as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The SWPPP shall include a copy of the Notification of Construction.

The Contractor shall not perform work that may cause water pollution until the SWPPP has been approved by the Engineer. The Engineer's review and approval shall not waive any contract requirements and shall not relieve the Contractor from complying with Federal, State and local laws, regulations, and requirements.

The Contractor shall amend the SWPPP annually and shall resubmit it to the Engineer 25 days before the defined rainy season.

If there is a change in construction schedule or activities, the Contractor shall prepare an amendment to the SWPPP to identify additional or revised water pollution control practices. The Contractor shall submit the amendment to the Engineer for review within a time agreed to by the Engineer not to exceed the number of days specified for the initial submittal of the SWPPP. The Engineer will review the amendment within the same time allotted for the review of the initial submittal of the SWPPP.

If directed by the Engineer or requested in writing by the Contractor and approved by the Engineer, changes to the water pollution control work specified in these special provisions will be allowed. Changes may include addition of new water pollution control practices. The Contractor shall incorporate these changes in the SWPPP. Additional water pollution control work will be paid for as extra work in accordance with Section 4-1.03, "Extra work," of the Standard Specifications.

The Contractor shall keep a copy of the approved SWPPP at the job site. The SWPPP shall be made available when requested by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests from the public shall be directed to the Engineer.

SAMPLING AND ANALYSIS

The Contractor shall include a Sampling and Analysis Plan (SAP) in the SWPPP to monitor the effectiveness of the water pollution control practices. The Contractor shall prepare the SAP in conformance with the Preparation Manual.

The Contractor shall designate trained personnel to collect water quality samples. The personnel and training shall be documented in the SAP. Training shall consist of the following elements:

- A. SAP review,
- B. Health and safety review, and
- C. Sampling simulations.

In the SAP the Contractor shall describe the following water quality sampling procedures:

- A. Sampling preparation,
- B. Collection,
- C. Quality assurance and quality control,
- D. Sample labeling,
- E. Collection documentation,
- F. Sample shipping,
- G. Chain of custody,
- H. Sample numbering, and
- I. Precautions from the construction site health and safety plan.

The Contractor shall document sample collection during precipitation.

Samples to be analyzed in the field shall be taken by the Contractor's designated sampling personnel using collection and analysis methods, and equipment calibration specified by the manufacturer of the sampling equipment. Samples to be analyzed by a laboratory, shall be sampled, preserved, and analyzed by a State-certified laboratory in conformance with the requirements in 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants." The Contractor shall identify the State-certified laboratory, sample containers, preservation requirements, holding times, and analysis method in the SAP. A list of State-certified laboratories that are approved by the Department is available at:

<http://www.dhs.ca.gov/ps/ls/ELAP/html/lablist.htm>

Non-Visible Pollutants

This project has the potential to discharge non-visible pollutants in storm water from the construction site. The Contractor shall include in the SAP a description of the sampling and analysis strategy to be implemented on the project for monitoring non-visible pollutants.

In the SAP the Contractor shall identify potential non-visible pollutants that will be present on the construction site associated with the following:

- A. Construction materials and wastes;
- B. Existing contamination due to historical site usage; or
- C. Application of soil amendments, including soil stabilization products, with the potential to alter pH or contribute toxic pollutants to storm water.

The Contractor shall show the locations planned for storage and use of the potential non-visible pollutants on the SWPPP Water Pollution Control Drawings.

The Contractor shall include in the SAP the following list of conditions that require sampling when observed during a storm water inspection:

- A. Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions.
- B. Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but:
 - 1. A breach, leakage, malfunction, or spill is observed;
 - 2. The leak or spill has not been cleaned up before precipitation; and
 - 3. There is the potential for discharge of non-visible pollutants to surface waters or drainage system.
- C. Construction activities; such as application of fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or non-pigmented curing compound; have occurred during precipitation or within 24 hours preceding precipitation, and have the potential to discharge pollutants to surface waters or drainage system.
- D. Soil amendments, including soil stabilization products, with the potential to alter pH levels or contribute toxic pollutants to storm water runoff have been applied, and have the potential to discharge pollutants to surface waters or drainage system (unless independent test data are available that demonstrate acceptable concentrations of non-visible pollutants in the soil amendment).
- E. Storm water runoff from an area contaminated by historical usage of the site has the potential to discharge pollutants to surface waters or drainage system.

The Contractor shall describe in the SAP the schedule for collecting a sample downhill from each non-visible pollutant source and an uncontaminated control sample, during the first 2 hours of discharge from precipitation during daylight hours that result in enough discharge for sample collection. If discharge flows to the non-visible pollutant source, a sample shall be collected immediately downhill from where the discharge enters the Department's right of way. If precipitation occurs again after at least 72 hours of dry weather the Contractor shall take new samples.

In the SAP the Contractor shall identify sampling locations for collecting downstream and control samples, and the reason for their selection. The control sampling location shall be selected so the sample does not come into contact with materials, wastes or areas associated with potential non-visible pollutants or disturbed soil areas. The Contractor shall show non-visible pollutant sampling locations on the SWPPP Water Pollution Control Drawings.

The Contractor shall identify in the SAP the analytical method to be used for downhill and control samples for potential non-visible pollutants on the project.

Analytical Results and Evaluation

The Contractor shall submit a hard copy and electronic copy of water quality analytical results, and quality assurance and quality control data to the Engineer within 5 days of sampling for field analyses, and within 30 days for laboratory analyses. The Contractor shall also provide an evaluation of whether the downhill samples show levels of the tested parameter higher than in the control sample. If downhill or downstream samples show increased levels, the Contractor will assess the water pollution control measures, site conditions, and surrounding influences to determine the probable cause for the increase. As determined by the assessment, the Contractor will repair or modify water pollution control measures to address increases and amend the SWPPP as necessary. Electronic results (in one of the following file formats: .xls, .txt, .csv, .dbs, or .mdb) shall have the following information:

- A. Sample identification number.
- B. Contract number.
- C. Constituent.
- D. Reported value.
- E. Analytical method.
- F. Method detection limit.
- G. Reported limit.

The Contractor shall maintain the water quality sampling documentation and analytical results with the SWPPP on the project site.

If construction activities or knowledge of site conditions change such that discharges or sampling locations change, the Contractor shall amend the SAP in conformance with this section, "Water Pollution Control."

IMPLEMENTATION REQUIREMENTS

The Contractor's responsibility for SWPPP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved SWPPP, the deficiency shall be corrected immediately, unless an agreed date for correction is approved in writing by the Engineer. The deficiency shall be corrected before the onset of precipitation. If the Contractor fails to correct the deficiency by the agreed date or before the onset of precipitation, the Department may correct the deficiency and deduct the cost of correcting deficiencies from payments.

If the Contractor fails to conform to the provisions of this section, "Water Pollution Control," the Engineer may order the suspension of work until the project complies with the requirements of this section.

Year-Round

The Contractor shall monitor the National Weather Service weather forecast on a daily basis during the contract. The Contractor may use an alternative weather forecasting service if approved by the Engineer. Appropriate water pollution control practices shall be in place before precipitation.

The Contractor may discontinue earthwork operations for a disturbed area for up to 21 days and the disturbed soil area will still be considered active. When earthwork operations in the disturbed area have been completed, the Contractor shall implement appropriate water pollution control practices within 15 days, or before predicted precipitation, whichever occurs first.

Rainy Season

The Contractor shall provide soil stabilization and sediment control practices during the rainy season between October 1 and May 1.

The Contractor shall implement soil stabilization and sediment control practices a minimum of 10 days before the start of the rainy season.

During the defined rainy season, the active disturbed soil area of the project site shall be not more than 2 hectares. The Engineer may approve expansions of the active disturbed soil area limit if requested in writing. The Contractor shall maintain soil stabilization and sediment control materials on site to protect disturbed soil areas.

INSPECTION AND MAINTENANCE

The WPCM shall inspect the water pollution control practices identified in the SWPPP as follows:

- A. Before a forecasted storm,
- B. After precipitation that causes site runoff,
- C. At 24-hour intervals during extended precipitation,
- D. On a predetermined schedule, a minimum of once every 2 weeks outside of the defined rainy season, and
- E. On a predetermined schedule, a minimum of once a week during the defined rainy season.

The WPCM shall oversee the maintenance of the water pollution control practices.

The WPCM shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. A copy of the completed site inspection checklist shall be submitted to the Engineer within 24 hours of finishing the inspection.

REPORTING REQUIREMENTS

If the Contractor identifies discharges into surface waters or drainage systems causing or potentially causing pollution, or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 3 days of the discharge, notice or order. The report shall include the following information:

- A. The date, time, location, and nature of the operation, type of discharge and quantity, and the cause of the notice or order.
- B. The water pollution control practices used before the discharge, or before receiving the notice or order.
- C. The date of placement and type of additional or altered water pollution control practices placed after the discharge, or after receiving the notice or order.
- D. A maintenance schedule for affected water pollution control practices.

Annual Certifications

By June 15 of each year, the Contractor shall complete and submit to the Engineer an Annual Certification of Compliance, as contained in the Preparation Manual.

PAYMENT

During each estimate period the Contractor fails to conform to the provisions in this section, "Water Pollution Control," or fails to implement the water pollution control practices shown on the plans or specified elsewhere in these special provisions as items of work, the Department will withhold 25 percent of the progress payment.

Withholds for failure to perform water pollution control work will be in addition to all other withholds provided for in the contract. The Department will return performance-failure withholds in the progress payment following the correction of noncompliance.

The contract lump sum price paid for prepare storm water pollution prevention plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing, obtaining approval of, and amending the SWPPP, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for prepare storm water pollution prevention plan will be made as follows:

- A. After the SWPPP has been approved by the Engineer, 50 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly progress estimate.
- B. Forty percent of the contract item price for prepare storm water pollution prevention plan will be paid over the life of the contract.
- C. After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, payment for the remaining 10 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07A, "Payment Prior to Proposed Final Estimate."

Storm water sampling and analysis will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. No payment will be made for the preparation, collection, analysis, and reporting of storm water samples where appropriate water pollution control practices are not implemented before precipitation or if a failure of a water pollution control practice is not corrected before precipitation.

Implementation of water pollution control practices in areas outside the highway right of way not specifically provided for in the SWPPP or in these special provisions will not be paid for.

Water pollution control practices for which there are separate contract items of work will be measured and paid for as those contract items of work.

10-1.03 CONSTRUCTION SITE MANAGEMENT

Construction site management shall consist of controlling potential sources of water pollution before they come in contact with storm water systems or watercourses. The Contractor shall control material pollution and manage waste and non-storm water existing at the construction site by implementing effective handling, storage, use, and disposal practices.

Attention is directed to "Water Pollution Control" of these special provisions regarding the Contractor's appointment of a water pollution control manager (WPCM) for the project.

The Contractor shall train all employees and subcontractors regarding:

- A. Material pollution prevention and control;
- B. Waste management;
- C. Non-storm water management;
- D. Identifying and handling hazardous substances; and
- E. Potential dangers to humans and the environment from spills and leaks or exposure to toxic or hazardous substances.

Training shall take place before starting work on this project. New employees shall receive the complete training before starting work on this project. The Contractor shall have regular meetings to discuss and reinforce spill prevention and control; material delivery, storage, use, and disposal; waste management; and non-storm water management procedures.

Instructions for material and waste handling, storage, and spill reporting and cleanup shall be posted at all times in an open, conspicuous, and accessible location at the construction site.

Nonhazardous construction site waste and excess material shall be recycled when practical or disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, unless otherwise specified.

Vehicles and equipment at the construction site shall be inspected by the WPCM on a frequent, predetermined schedule, and by the operator each day of use. Leaks shall be repaired immediately, or the vehicle or equipment shall be removed from the construction site.

SPILL PREVENTION AND CONTROL

The Contractor shall implement spill and leak prevention procedures when chemicals or hazardous substances are stored. Spills of petroleum products; substances listed under CFR Title 40, Parts 110, 117, and 302; and sanitary and septic waste shall be contained and cleaned up as soon as is safe.

Minor spills involve small quantities of oil, gasoline, paint, or other material that can be controlled by the first responder upon discovery of the spill. Cleanup of minor spills includes:

- A. Containing the spread of the spill,
- B. Recovering the spilled material using absorption,
- C. Cleaning the contaminated area, and
- D. Disposing of contaminated material promptly and properly.

Semi-significant spills are those that can be controlled by the first responder with the help of other personnel. Cleanup of semi-significant spills shall be immediate. Cleanup of semi-significant spills includes:

- A. Containing the spread of the spill;
- B. Recovering the spilled material using absorption if the spill occurs on paved or an impermeable surface;
- C. Containing the spill with an earthen dike and digging up contaminated soil for disposal if the spill occurs on dirt;
- D. Covering the spill with plastic or other material to prevent contaminating runoff if the spill occurs during precipitation; and

E. 10-1.04 CONSTRUCTION SITE MANAGEMENT

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- E. Potential dangers to humans and the environment from spills and leaks or exposure to toxic or hazardous substances.

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- D. Disposing of contaminated material promptly and properly.

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- A. Containing the spread of the spill;
- B. Recovering the spilled material using absorption if the spill occurs on paved or an impermeable surface;
- C. Containing the spill with an earthen dike and digging up contaminated soil for disposal if the spill occurs on dirt;
- D. Covering the spill with plastic or other material to prevent contaminating runoff if the spill occurs during precipitation; and
- E. Disposing of contaminated material promptly and properly.

Significant or hazardous spills are those that cannot be controlled by construction personnel. Notifications of these spills shall be immediate. The following steps shall be taken:

- A. Construction personnel shall not attempt to cleanup the spill until qualified staff have arrived;
- B. Notify the Engineer and follow up with a written report;
- C. Obtain the services of a spills contractor or hazardous material team immediately;
- D. Notify the local emergency response team by dialing 911 and county officials at the emergency phone numbers kept on the construction site;
- E. Notify the Governor's Office of Emergency Services Warning Center at (805) 852-7550;
- F. Notify the National Response Center at (800) 424-8802 regarding spills of Federal reportable quantities in conformance with CFR Title 40, Parts 110, 119, and 302;
- G. Notify other agencies as appropriate, including:
 - 1. Fire Department,
 - 2. Public Works Department,
 - 3. Coast Guard,
 - 4. Highway Patrol,
 - 5. City Police or County Sheriff Department,
 - 6. Department of Toxic Substances,
 - 7. California Division of Oil and Gas,
 - 8. Cal OSHA, or
 - 9. Regional Water Resources Control Board.

The WPCM shall oversee and enforce proper spill prevention and control measures. Minor, semi-significant, and significant spills shall be reported to the Contractor's WPCM who shall notify the Engineer immediately.

The Contractor shall prevent spills from entering storm water runoff before and during cleanup. Spills shall not be buried or washed with water.

The Contractor shall keep material or waste storage areas clean, well organized, and equipped with enough cleanup supplies for the material being stored. Plastic shall be placed under paving equipment when not in use to catch drips.

MATERIAL MANAGEMENT

Material shall be delivered, used, and stored for this contract in a manner that minimizes or eliminates discharge of material into the air, storm drain systems, or watercourses.

The Contractor shall implement the practices described in this section when taking delivery of, using, or storing the following materials:

A. Hazardous chemicals including:

1. Acids,
2. Lime,
3. Glues,
4. Adhesives,
5. Paints,
6. Solvents, and
7. Curing compounds;

B. Soil stabilizers and binders;

C. Fertilizers;

D. Detergents;

E. Plaster;

F. Petroleum products including:

1. Fuel,
2. Oil, and
3. Grease;

G. Asphalt components and concrete components; and

H. Pesticides and herbicides.

The Contractor shall supply the Material Safety Data Sheet to the Engineer for material used or stored. The Contractor shall keep an accurate inventory of material delivered and stored at the construction site.

Employees trained in emergency spill cleanup procedures shall be present when hazardous materials or chemicals are unloaded.

The Contractor shall use recycled or less hazardous products when practical.

Material Storage

The Contractor shall store liquids, petroleum products, and substances listed in CFR Title 40, Parts 110, 117, and 302 in containers or drums approved by the United States Environmental Protection Agency, and place them in secondary containment facilities.

Secondary containment facilities shall be impervious to the materials stored there for a minimum contact time of 72 hours.

Throughout the rainy season secondary containment facilities shall be covered during non-working days and when precipitation is predicted. Secondary containment facilities shall be adequately ventilated.

The Contractor shall keep the secondary containment facility free of accumulated rainwater or spills. After precipitation, or in the event of spills or leaks, accumulated liquid shall be collected and placed into drums within 24 hours. These liquids shall be handled as hazardous waste in accordance with the provisions in "Hazardous Waste" of these special provisions, unless testing determines them to be nonhazardous.

Incompatible materials, such as chlorine and ammonia, shall not be stored in the same secondary containment facility.

Materials shall be stored in the original containers with the original product labels maintained in legible condition. Damaged or illegible labels shall be replaced immediately.

The secondary containment facility shall have the capacity to contain precipitation from a 24-hour-long, 25-year storm; and 10 percent of the aggregate volume of all containers, or all of the volume of the largest container within the facility, whichever is greater.

The Contractor shall store bagged or boxed material on pallets. Throughout the rainy season, bagged or boxed material shall be protected from wind and rain during non-working days and when precipitation is predicted.

The Contractor shall provide sufficient separation between stored containers to allow for spill cleanup or emergency response access. Storage areas shall be kept clean, well organized, and equipped with cleanup supplies appropriate for the materials being stored.

The Contractor shall repair or replace perimeter controls, containment structures, covers, and liners as needed. Storage areas shall be inspected before and after precipitation, and at least weekly during other times.

Stockpile Management

The Contractor shall reduce or eliminate potential air and water pollution from stockpiled material including soil, paving material, or pressure treated wood. Stockpiles shall be located out of floodplains when possible, and at least 15 m from concentrated flows of storm water, drainage courses, or inlets unless written approval is obtained from the Engineer.

The Contractor may discontinue adding or removing material for up to 21 days and a stockpile will still be considered active.

The Contractor shall protect active stockpiles with plastic or geotextile cover, soil stabilization measures, or with linear sediment barrier when precipitation is predicted. Active stockpiles of cold mix asphalt concrete shall be placed on an impervious surface and covered with plastic when precipitation is predicted.

The Contractor shall protect inactive soil stockpiles with a plastic or geotextile cover, or with soil stabilization measures at all times during the rainy season. A linear sediment barrier around the perimeter of the stockpile shall also be used. During the non-rainy season soil stockpiles shall be covered and protected with a linear sediment barrier when precipitation is predicted. The Contractor shall control wind erosion during dry weather as provided in Section 10, "Dust Control," of the Standard Specifications.

Stockpiles of portland cement concrete rubble, asphalt concrete (AC), hot mix asphalt (HMA), AC and HMA rubble, aggregate base, or aggregate subbase shall be covered with plastic or geotextile, or protected with a linear sediment barrier at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

Stockpiles of cold mix asphalt concrete shall be placed on and covered with impermeable material at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

Stockpiles of pressure treated wood shall be covered with impermeable material and placed on pallets at all times during the rainy season, and when precipitation is predicted during the non-rainy season.

The Contractor shall repair or replace linear sediment barriers and covers as needed or as directed by the Engineer to keep them functioning properly. Sediment shall be removed when it accumulates to 1/3 of the linear sediment barrier height.

WASTE MANAGEMENT

Solid Waste

The Contractor shall not allow litter or debris to accumulate anywhere on the construction site, including storm drain grates, trash racks, and ditch lines. The Contractor shall pick up and remove trash and debris from the construction site at least once a week. The WPCM shall monitor solid waste storage and disposal procedures on the construction site. The Contractor shall provide enough dumpsters of sufficient size to contain the solid waste generated by the project. Dumpsters shall be emptied when refuse reaches the fill line. Dumpsters shall be watertight. The Contractor shall not wash out dumpsters on the construction site. The Contractor shall provide additional containers and more frequent pickup during the demolition phase of construction

Solid waste includes:

- A. Brick,
- B. Mortar,
- C. Timber,
- D. Metal scraps,
- E. Sawdust,
- F. Pipe,
- G. Electrical cuttings,
- H. Non-hazardous equipment parts,
- I. Styrofoam and other packaging materials,
- J. Vegetative material and plant containers from highway planting, and
- K. Litter and smoking material, including litter generated randomly by the public.

Trash receptacles shall be provided and used in the Contractor's yard, field trailers, and locations where workers gather for lunch and breaks.

Hazardous Waste

The Contractor shall implement hazardous waste management practices when waste is generated on the construction site from the following substances:

- A. Petroleum products,
- B. Asphalt products,
- C. Concrete curing compound,
- D. Pesticides,

- E. Acids,
- F. Paints,
- G. Stains,
- H. Solvents,
- I. Wood preservatives,
- J. Roofing tar, and
- K. Materials classified as hazardous by California Code of Regulations, Title 22, Division 4.5; or listed in CFR Title 40, Parts 110, 117, 261, or 302.

Nothing in these special provisions shall relieve the Contractor of the responsibility for compliance with Federal, State, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.

The WPCM shall oversee and enforce hazardous waste management practices. Production of hazardous materials and hazardous waste on the construction site shall be kept to a minimum. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced when damaged.

The Contractor shall have a laboratory certified by the Department of Health Services (DHS) sample and test waste when hazardous material levels are unknown to determine safe methods for storage and disposal.

The Contractor shall segregate potentially hazardous waste from nonhazardous waste at the construction site. Hazardous waste shall be handled, stored, and disposed of as required in California Code of Regulations, Title 22, Division 4.5, Section 66262.34; and in CFR Title 49, Parts 261, 262, and 263.

The Contractor shall store hazardous waste in sealed containers constructed and labeled with the contents and date accumulated as required in California Code of Regulations, Title 22, Division 4.5; and in CFR Title 49, Parts 172, 173, 178, and 179. Hazardous waste containers shall be kept in temporary containment facilities conforming to the provisions in "Material Storage" of these special provisions.

There shall be adequate storage volume and containers shall be conveniently located for hazardous waste collection. Containers of hazardous waste shall not be overfilled and hazardous wastes shall not be mixed. Containers of dry waste that are not watertight shall be stored on pallets. The Contractor shall not allow potentially hazardous waste to accumulate on the ground. Hazardous waste shall be stored away from storm drains, watercourses, moving vehicles, and equipment.

The Contractor shall clean water based or oil based paint from brushes or equipment within a contained area and shall not contaminate soil, watercourses, or storm drain systems. Paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.

The Contractor shall dispose of hazardous waste within 90 days of being generated. Hazardous waste shall be disposed of by a licensed hazardous waste transporter using uniform hazardous waste manifest forms and taken to a Class I Disposal Site. A copy of the manifest shall be provided to the Engineer.

Contaminated Soil

The Contractor shall identify contaminated soil from spills or leaks by noticing discoloration, odors, or differences in soil properties. Soil with evidence of contamination shall be sampled and tested by a laboratory certified by DHS. If levels of contamination are found to be hazardous, the soil shall be handled and disposed of as hazardous waste.

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

- A. Berms,
- B. Cofferdams,
- C. Grout curtains,
- D. Freeze walls, or
- E. Concrete seal course.

If water mixes with contaminated soil and becomes contaminated, the water shall be sampled and tested by a laboratory certified by the DHS. If levels of contamination are found to be hazardous, the water shall be handled and disposed of as hazardous waste.

Concrete Waste

The Contractor shall implement practices to prevent the discharge of portland cement concrete, AC, or HMA waste into storm drain systems or watercourses.

Portland cement concrete, AC, or HMA waste shall be collected at the following locations and disposed of:

- A. Where concrete material, including grout, is used;

- B. Where concrete dust and debris result from demolition;
- C. Where sawcutting, coring, grinding, grooving, or hydro-concrete demolition of portland cement concrete, AC, or HMA creates a residue or slurry; or
- D. Where concrete trucks or other concrete-coated equipment is cleaned at the construction site.

Sanitary and Septic Waste

Wastewater from sanitary or septic systems shall not be discharged or buried within the Department right of way. The WPCM shall inspect sanitary or septic waste storage and monitor disposal procedures at least weekly. Sanitary facilities that discharge to the sanitary sewer system shall be properly connected and free from leaks.

The Contractor shall obtain 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, and provide a copy to the Engineer. The Contractor shall comply with local health agency requirements when using an on-site disposal system.

Liquid Waste

The Contractor shall not allow construction site liquid waste, including the following, to enter storm drain systems or watercourses:

- A. Drilling slurries or fluids,
- B. Grease-free or oil-free wastewater or rinse water,
- C. Dredgings,
- D. Liquid waste running off a surface including wash or rinse water, or
- E. Other non-storm water liquids not covered by separate permits.

The Contractor shall hold liquid waste in structurally sound, leak proof containers such as:

- A. Sediment traps,
- B. Roll-off bins, or
- C. Portable tanks.

Liquid waste containers shall be of sufficient quantity and volume to prevent spills and leaks. The containers shall be stored at least 15 m from storm drains, watercourses, moving vehicles, and equipment.

The Contractor shall remove and dispose of deposited solids from sediment traps as provided in "Solid Waste" of these special provisions, unless determined infeasible by the Engineer.

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

Drilling fluids and residue shall be disposed of outside the highway right of way. If the Engineer determines that an appropriate location is available, fluids and residue exempt under California Code of Regulations, Title 23, Section 2511(g) may be dried by infiltration and evaporation in a leak proof container. The remaining solid waste may be disposed of as provided in "Solid Waste" of these special provisions.

NON-STORM WATER MANAGEMENT

Water Control and Conservation

The Contractor shall prevent erosion or the discharge of pollutants into storm drain systems or watercourses by managing the water used for construction operations. The Contractor shall obtain the Engineer's approval before washing anything on the construction site with water that could discharge into a storm drain system or watercourse. Discharges shall be reported to the Engineer immediately.

The Contractor shall implement water conservation practices when water is used on the construction site. Irrigation areas shall be inspected and watering schedules shall be adjusted to prevent erosion, excess watering, or runoff. The Contractor shall shut off the water source to broken lines, sprinklers, or valves, and they shall be repaired as soon as possible. When possible, water from waterline flushing shall be reused for landscape irrigation. Paved areas shall be swept and vacuumed, not washed with water.

Construction water runoff, including water from water line repair, shall be directed to areas to infiltrate into the ground and shall not be allowed to enter storm drain systems or watercourses. Spilled water shall not be allowed to escape water truck filling areas. When possible, the Contractor shall direct water from off-site sources around the construction site, or shall minimize contact with the construction site.

Illegal Connection and Discharge Detection and Reporting

The Contractor shall inspect the construction site and the site perimeter before beginning work for evidence of illegal connections, discharges, or dumping. Subsequently, the construction site and perimeter shall be inspected on a frequent, predetermined schedule.

The Contractor shall immediately notify the Engineer when illegal connections, discharges, or dumping are discovered. The Contractor shall take no further action unless directed by the Engineer. Unlabeled or unidentifiable material shall be assumed to be hazardous.

The Contractor shall look for the following evidence of illegal connections, discharges, or dumping:

- A. Debris or trash piles,
- B. Staining or discoloration on pavement or soils,
- C. Pungent odors coming from drainage systems,
- D. Discoloration or oily sheen on water,
- E. Stains or residue in ditches, channels or drain boxes,
- F. Abnormal water flow during dry weather,
- G. Excessive sediment deposits,
- H. Nonstandard drainage junction structures, or
- I. Broken concrete or other disturbances near junction structures.

Vehicle and Equipment Cleaning

The Contractor shall limit vehicle and equipment cleaning or washing on the construction site to that necessary to control vehicle tracking or hazardous waste. Vehicles and equipment shall not be cleaned on the construction site with soap, solvents, or steam until the Engineer has been notified. The resulting waste shall be contained and recycled, or disposed of as provided in "Liquid Waste" or "Hazardous Waste" of these special provisions, whichever is applicable. The Contractor shall not use diesel to clean vehicles or equipment, and shall minimize the use of solvents.

The Contractor shall clean or wash vehicles and equipment in a structure equipped with disposal facilities. If using a structure is not possible, vehicles and equipment shall be cleaned or washed in an outside area with the following characteristics:

- A. Located at least 15 m from storm drainage systems or watercourses,
- B. Paved with AC, HMA or portland cement concrete,
- C. Surrounded by a containment berm, and
- D. Equipped with a sump to collect and dispose of wash water.

When washing vehicles or equipment with water, the Contractor shall use as little water as possible. Hoses shall be equipped with a positive shutoff valve.

Wash racks shall discharge to a recycle system or to another system approved by the Engineer. Sumps shall be inspected regularly, and liquids and sediments shall be removed as needed.

Vehicle and Equipment Fueling and Maintenance

The Contractor shall fuel or perform maintenance on vehicles and equipment off the construction site whenever practical. When fueling or maintenance must be done at the construction site, the Contractor shall designate a site, or sites, and obtain approval from the Engineer before using. The fueling or maintenance site shall be protected from storm water, shall be on level ground, and shall be located at least 15 m from drainage inlets or watercourses. The WPCM shall inspect the fueling or maintenance site regularly. Mobile fueling or maintenance shall be kept to a minimum.

The Contractor shall use containment berms or dikes around the fueling and maintenance area. Adequate amounts of absorbent spill cleanup material and spill kits shall be kept in the fueling and maintenance area and on fueling trucks. Spill cleanup material and kits shall be disposed of immediately after use. Drip pans or absorbent pads shall be used during fueling or maintenance unless performed over an impermeable surface.

Fueling or maintenance operations shall not be left unattended. Fueling nozzles shall be equipped with an automatic shutoff control. Vapor recovery fueling nozzles shall be used where required by the Air Quality Management District. Nozzles shall be secured upright when not in use. Fuel tanks shall not be topped-off.

The Contractor shall recycle or properly dispose of used batteries and tires.

Material and Equipment Used Over Water

Drip pans and absorbent pads shall be placed under vehicles or equipment used over water, and an adequate supply of spill cleanup material shall be kept with the vehicle or equipment. Drip pans or plastic sheeting shall be placed under vehicles or equipment on docks, barges, or other surfaces over water when the vehicle or equipment will be idle for more than one hour.

The Contractor shall provide watertight curbs or toe boards on barges, platforms, docks, or other surfaces over water to contain material, debris, and tools. Material shall be secured to prevent spills or discharge into water due to wind.

Structure Removal Over or Adjacent to Water

The Contractor shall not allow demolished material to enter storm water systems or watercourses. The Contractor shall use covers and platforms approved by the Engineer to collect debris. Attachments shall be used on equipment to catch debris on small demolition operations. Debris catching devices shall be emptied regularly and debris shall be handled as provided in "Waste Management" of these special provisions.

The WPCM shall inspect demolition sites within 15 m of storm water systems or watercourses every day.

Paving, Sealing, Sawcutting, and Grinding Operations

The Contractor shall prevent the following material from entering storm drain systems or water courses:

- A. Cementitious material,
- B. Asphaltic material,
- C. Aggregate or screenings,
- D. Grinding or sawcutting residue,
- E. Pavement chunks, or
- F. Shoulder backing.

The Contractor shall cover drainage inlets and use linear sediment barriers to protect downhill watercourses until paving, sealing, sawcutting, or grinding operations are completed and excess material has been removed. Drainage inlets and manholes shall be covered during the application of seal coat, tack coat, slurry seal, or fog seal.

During the rainy season or when precipitation is predicted, paving, sawcutting, and grinding operations shall be limited to places where runoff can be captured. Seal coat, tack coat, slurry seal, or fog seal operations shall not begin if precipitation is predicted for the application or the curing period. The Contractor shall not excavate material from existing roadways during precipitation.

The Contractor shall vacuum up slurry from sawcutting operations immediately after the slurry is produced. Slurry shall not be allowed to run onto lanes open to public traffic or off the pavement.

The Contractor shall collect residue from portland cement concrete grinding operations with a vacuum attachment on the grinding machine. The residue shall not be left on the pavement or allowed to flow across the pavement.

Material excavated from existing roadways may be stockpiled as provided in "Stockpile Management" of these special provisions if approved by the Engineer. AC or HMA chunks used in embankment shall be placed above the water table and covered by at least 0.3-m of material.

Substances used to coat asphalt trucks and equipment shall not contain soap, foaming agents, or toxic chemicals.

Thermoplastic Striping and Pavement Markers

Thermoplastic striping and preheating equipment shutoff valves shall work properly at all times when on the construction site. The Contractor shall not preheat, transfer, or load thermoplastic within 15 m of drainage inlets or watercourses. The Contractor shall not fill the preheating container to more than 150 mm from the top. Truck beds shall be cleaned daily of scraps or melted thermoplastic.

The Contractor shall not unload, transfer, or load bituminous material for pavement markers within 15 m of drainage inlets or watercourses. All pressure shall be released from melting tanks before removing the lid to fill or service. Melting tanks shall not be filled to more than 150 mm from the top.

The Contractor shall collect bituminous material from the roadway after marker removal.

Pile Driving

The Contractor shall keep spill kits and cleanup material at pile driving locations. Pile driving equipment shall be parked over drip pans, absorbent pads, or plastic sheeting where possible. When not in use, pile driving equipment shall be stored at least 15 m from concentrated flows of storm water, drainage courses, or inlets. The Contractor shall protect pile driving equipment by parking it on plywood and covering it with plastic when precipitation is predicted. The WPCM shall inspect the pile driving area every day for leaks and spills.

The Contractor shall use vegetable oil instead of hydraulic fluid when practical.

Concrete Curing

The Contractor shall not overspray chemical curing compound. Drift shall be minimized by spraying as close to the concrete as possible. Drainage inlets shall be covered before applying curing compound.

The Contractor shall minimize the use and discharge of water by using wet blankets or similar methods to maintain moisture when curing concrete.

Concrete Finishing

The Contractor shall collect and dispose of water and solid waste from high-pressure water blasting. Drainage inlets within 15 m shall be covered before sandblasting. The nozzle shall be kept as close to the surface of the concrete as possible to minimize drift of dust and blast material. Blast residue may contain hazardous material.

Containment structures for concrete finishing operations shall be inspected for damage before each day of use and before predicted precipitation. Liquid and solid waste shall be removed from the containment structure after each work shift.

DEWATERING

Dewatering shall consist of discharging accumulated storm water, ground water, or surface water from excavations or temporary containment facilities. The Contractor shall discharge water within the limits of the project.

Dewatering discharge shall not cause erosion, scour, or sedimentary deposits that impact natural bedding materials.

The Contractor shall conduct dewatering activities in accordance with the Field Guide for Construction Dewatering available at:

<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

Before dewatering the Contractor shall submit a Dewatering and Discharge Plan to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and "Water Pollution Control," of these special provisions. At a minimum, the Dewatering and Discharge Plan shall include the following:

- A. A title sheet and table of contents;
- B. A description of the dewatering and discharge operations detailing the locations, quantity of water, equipment, and discharge point;
- C. The estimated schedule for dewatering and discharge (begin and end dates, intermittent or continuous);
- D. Discharge alternatives such as dust control or percolation; and
- E. Visual monitoring procedures with inspection log.

The Contractor shall not discharge storm water or non-storm water that has an odor, discoloration other than sediment, an oily sheen, or foam on the surface and shall notify the Engineer immediately upon discovery.

If water cannot be discharged within the project limits due to site constraints it shall be disposed of in the same manner specified for material in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

PAYMENT

The contract lump sum price paid for construction site management shall include 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, non-storm water management, and dewatering and identifying, sampling, testing, handling, and disposing of hazardous waste, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.05 TEMPORARY HYDRAULIC MULCH

This work includes furnishing, applying, maintaining, and later removing temporary hydraulic mulch at locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions. Hydraulic mulch uses a mixture of fiber, tackifier, and water to stabilize active and nonactive disturbed soil areas.

The Contractor must use hydraulic mulch as a water pollution control practice for soil stabilization. The Storm Water Pollution Prevention Plan must describe and include the use of hydraulic mulch.

Apply temporary hydraulic mulch when an area is ready to receive temporary erosion control as determined by the Engineer and under "Move-in/Move-out (Temporary Erosion Control)" of these special provisions.

MATERIALS

Tackifier

The tackifier shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions. The tackifier shall be nonflammable, nontoxic to aquatic organisms, and shall have no growth or germination inhibiting factors.

1) Tackifier (Plant-Based)

Tackifier shall be a natural high molecular weight polysaccharide derived from a natural, plant-based source. Tackifier shall be a high viscosity hydrocolloid that is miscible in water. Tackifier shall have a minimum functional longevity of 6 months and conform to and be labeled as one of the following:

- A. Guar shall be a guar gum based product derived from the ground endosperm of the guar plant, *Cyanopsis tetragonolobus*. Guar shall be treated with dispersant agents for easy mixing. It shall be diluted at the rate of 1.2 to 1.8 kg per 1000 liters of water.
- B. Psyllium shall consist of the finely ground muciloid coating of *plantago ovata* or *plantago ispaghula* seeds. Psyllium shall dry to form a firm but rewettable membrane.
- C. Starch shall be a non-ionic, water soluble granular material derived from corn, potato, or other plant-based source.

2) Tackifier (Polymeric Emulsion Blends)

The tackifier shall be a polymeric emulsion blend with a liquid or dry powder formulation. The primary active and nonactive polymeric ingredients shall be anionic with a residual monomer content that does not exceed 0.05 percent by weight. Tackifier shall have a minimum functional longevity of 6 months. Tackifier shall be available as a prepackaged product. The tackifier shall be labeled as containing one of the following as the primary active ingredient of the polymeric emulsion blend:

- A. Acrylic copolymers and polymers.
- B. Polymers of methacrylates and acrylates
- C. Copolymers of sodium acrylates and acrylamides
- D. Polyacrylamide (PAM) and copolymer of acrylamide
- E. Hydrocolloid polymers

The product label shall indicate that the tackifier is registered and approved by the California Department of Food and Agriculture as an auxiliary soil and plant substance, and nonplant food ingredient.

Wood Fiber

Wood fiber shall conform to the provisions in Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Fiber shall be long strand, whole wood fibers, thermo-mechanically processed from clean, whole wood chips, containing a minimum of 25 percent at 10 mm long, with a minimum of 40 percent retained on a 710 μm sieve. The wood chips shall not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. Fiber shall not be produced from sawdust, cardboard, paper, or paper by-products.

Cellulose Fiber

Cellulose fiber shall conform to the provisions in Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Cellulose fiber shall be produced from natural or recycled (pulp) fiber, such as wood chips, sawdust, newsprint, chipboard, corrugated cardboard, or a combination of these processed materials. Cellulose fiber shall be free of synthetic or plastic materials, and shall not contain more than 7 percent ash.

Alternate Fiber

Alternate fiber shall conform to the provisions in Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Alternate fiber shall be long-strand, whole natural fibers, processed from clean straw, cotton, corn or other natural feed stock, containing a minimum of 25 percent at 10 mm long, with a minimum of 40 percent retained on a 710 μm sieve. Alternate fiber shall be free of synthetic or plastic materials, and shall not contain more than 7 percent ash.

A coloring agent shall be added to the temporary hydraulic mulch to contrast with the area on which it is applied. The coloring agent shall not include copper, mercury, or arsenic, and shall be biodegradable and nontoxic.

A Certificate of Compliance for temporary hydraulic mulch shall be furnished to the Engineer in accordance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance shall include a list of pollutant indicators and potential pollutants not visually detectable as described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Storm Water Pollution Prevention Plan and Water Pollution Control Program Preparation Manual of the Storm Water Quality Handbooks issued by the Department.

The Contractor shall provide written documentation certifying the temporary hydraulic mulch was applied in accordance with specified rates, including area of application, time of application, and quantities used.

Monitoring for pollutants not visually detectable in storm water is required by the General Construction NPDES Permit for soil amendments, including soil stabilization products.

APPLICATION

Temporary hydraulic mulch shall be applied as follows:

- A. The following mixture in the proportions indicated shall be applied with hydroseeding equipment. Successive applications or passes shall be used to achieve the indicated rate:

| Material | Application Rate |
|-----------------|------------------|
| Wood Fiber | 1250 kg/ha |
| Cellulose Fiber | 1250 kg/ha |

* At the option of the Contractor, wood fiber or alternate fiber may be used instead of cellulose fiber.

- B. The quantity of tackifier to water and fiber per acre shall be as recommended by the manufacturer.
- C. The dilution of fiber to water per acre shall be as required to facilitate even application of material.
- D. Material shall be applied to form a continuous mat covering all disturbed soil surface, shall have a minimum thickness of 2 mm, and shall have no gaps between the mat and the soil surface.
- E. Material shall be applied from 2 or more directions to achieve a continuous mat.
- F. Material shall be applied in layers to avoid slumping and to aid drying.
- G. Material shall be applied during dry weather, with a minimum of 24 hours of dry weather between completion of material application and predicted precipitation.

MAINTENANCE

The hydraulic mulch shall be reapplied when the area treated with temporary hydraulic mulch exhibits visible erosion. The hydraulic mulch shall be reapplied within 24 hours of identifying visible erosion, or longer if approved by the Engineer.

REMOVAL

Removal shall consist of mechanically incorporating the hydraulic mulch into the soil with track laying equipment, disking, or other method approved by the Engineer.

MEASUREMENT AND PAYMENT

The quantity of temporary hydraulic mulch to be paid for will be measured by the square meter as determined from measurements along the slope of the actual areas covered by the temporary hydraulic mulch.

The contract price paid per square meter for temporary hydraulic mulch shall include full compensation for furnishing all labor, materials (including fiber and tackifier), tools, equipment, and incidentals, and for doing all the work involved in applying temporary hydraulic mulch, complete in place, including removal of hydraulic mulch, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary hydraulic mulch disturbed or displaced by the Contractor's vehicles, equipment, or operations shall be reapplied at the Contractor's expense.

The cost of maintaining the temporary hydraulic mulch will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary hydraulic mulch in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.06 STREET SWEEPING

Street sweeping shall be conducted where sediment is tracked from the job site onto paved roads, as described in the approved Storm Water Pollution Prevention Plan (SWPPP) in accordance with "Water Pollution Control" of these special provisions, and as directed by the Engineer.

Street sweeping shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of street sweeping. Street sweeping shall be performed in accordance with Section 4, SC-7 in the Construction Site Best Management Practices Manual of the Caltrans Storm Water Quality Handbooks.

The number of street sweepers shall be as designated in the approved SWPPP. The Contractor shall maintain at least one sweeper on the job site at all times during the period that sweeping work is required. Sweepers shall be self-loading, motorized, and shall have spray nozzles. Sweepers may include a vacuum apparatus.

Street sweeping shall start at the beginning of clearing and grubbing and shall continue until completion of the project, or as directed by the Engineer. Street sweeping shall be performed immediately after soil disturbing activities occur or offsite tracking of material is observed. Street sweeping shall be performed so that dust is minimized. If dust generation is excessive or sediment pickup is ineffective as determined by the Engineer, the use of water or a vacuum will be required.

At the option of the Contractor, collected material may be temporarily stockpiled in accordance with the approved SWPPP. Collected material shall be disposed of at least once per week.

Material collected during street sweeping operations shall be disposed of in conformance with Section 7-1.13, "Disposal of Material Outside The Highway Right Of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

The contract lump sum price paid for street sweeping shall include 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.

10-1.07 TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)

Temporary hydraulic mulch (bonded fiber matrix) shall be furnished, applied, maintained, and later removed at locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary hydraulic mulch (bonded fiber matrix) shall consist of applying a bonded fiber matrix to active and non-active disturbed areas.

The bonded fiber matrix shall be used as a water pollution control practice for soil stabilization. The Storm Water Pollution Prevention Plan shall include the use of bonded fiber matrix.

MATERIALS

Tackifier

The tackifier shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications. The tackifier shall be nonflammable, nontoxic to aquatic organisms, and shall have no growth or germination inhibiting factors.

The tackifier shall be an organic, high viscosity colloidal polysaccharide with activating agents, or a blended hydrocolloid-based binder. The tackifier shall be bonded to the fiber or prepackaged with the fiber by the manufacturer. The tackifier, including activating agents and additives, shall be a minimum of 10 percent by weight of the fiber.

Fiber

Fiber shall conform to the provisions in Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Fiber shall be long strand, whole wood fibers, thermo-mechanically processed from clean, whole wood chips, containing a minimum of 25 percent at 10 mm long, with a minimum of 50 percent retained on a 710 μ m sieve. The wood chips shall not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. Fiber shall not be produced from sawdust, cardboard, paper, or paper by-products.

A coloring agent shall be added to the bonded fiber matrix to contrast with the area on which it is applied. The coloring agent shall not include copper, mercury, or arsenic, and shall be biodegradable and nontoxic.

A Certificate of Compliance for temporary hydraulic mulch (bonded fiber matrix) shall be furnished to the Engineer in accordance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance shall include a list of pollutant indicators and potential pollutants not visually detectable as described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Storm Water Pollution Prevention Plan and Water Pollution Control Program Preparation Manual of the Storm Water Quality Handbooks issued by the Department.

The Contractor shall provide written documentation certifying the temporary hydraulic mulch (bonded fiber matrix) was applied in accordance with specified rates, including area of application, time of application, and quantities used.

Monitoring for pollutants not visually detectable in storm water is required by the General Construction NPDES Permit for soil amendments, including soil stabilization products.

APPLICATION

Temporary hydraulic mulch (bonded fiber matrix) shall be applied as follows:

- A. Temporary hydraulic mulch shall be applied with hydroseeding equipment. Successive applications or passes shall be used to achieve the indicated rate:

| Material | Kilograms Per Hectare
(slope measurement) |
|------------------------------------------------------------|----------------------------------------------|
| Bonded Fiber
(includes fiber and
tackifier material) | 4,500 |

- B. The dilution of bonded fiber to water per hectare shall be as required to facilitate even application of material.
- C. Material shall be applied to form a continuous mat covering all of the disturbed soil surface, shall have a minimum thickness of 3 mm, and shall have no gaps between the mat and the soil surface.
- D. Material shall be applied from 2 or more directions to achieve a continuous mat.
- E. Material shall be applied in layers to avoid slumping and to aid drying.
- F. Material shall be applied during dry weather, with a minimum of 24 hours of dry weather between completion of material application and predicted precipitation.

MAINTENANCE

Bonded fiber matrix shall be reapplied when the area treated with bonded fiber matrix exhibits visible erosion. Bonded fiber matrix shall be reapplied within 24 hours of identifying visible erosion or longer if approved by the Engineer.

REMOVAL

Removal shall consist of mechanically incorporating the temporary hydraulic mulch into the soil with tracklaying equipment, disking, or other methods approved by the Engineer.

MEASUREMENT AND PAYMENT

The quantity of temporary hydraulic mulch (bonded fiber matrix) to be paid for will be measured by the square meter as determined from measurements along the slope of the actual areas covered by the temporary hydraulic mulch (bonded fiber matrix).

The contract price paid per square meter for temporary hydraulic mulch (bonded fiber matrix) shall include full compensation for furnishing all labor, materials (including bonded fiber), tools, equipment, and incidentals, and for doing all the work involved in applying bonded fiber matrix, complete in place, including removal of bonded fiber matrix, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary hydraulic mulch (bonded fiber matrix) disturbed or displaced by the Contractor's vehicles, equipment, or operations shall be reapplied at the Contractor's expense.

The cost of maintaining the temporary hydraulic mulch (bonded fiber matrix) will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary hydraulic mulch (bonded fiber matrix) in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.08 TEMPORARY CONCRETE WASHOUT FACILITY

Temporary concrete washout facilities shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary concrete washout facilities shall be one of the water pollution control practices for waste management and materials pollution control. The SWPPP shall include the use of temporary concrete washout facilities.

MATERIALS

Plastic Liner

Plastic liners shall be single ply, new polyethylene sheeting, a minimum of 0.25-mm thick and shall be free of holes, punctures, tears or other defects that compromise the impermeability of the material. Plastic liners shall not have seams or overlapping joints.

Gravel-filled Bags

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

| Specification | Requirements |
|-----------------------------------------------------------------------------------------------------------------------------|--------------|
| Mass per unit area, grams per square meter, min.
ASTM Designation: D 5261 | 270 |
| Grab tensile strength (25-mm grip), kilonewtons, min.
ASTM Designation: D4632* | 0.89 |
| Ultraviolet stability, percent tensile strength retained after 500 hours,
ASTM Designation: D4355, xenon arc lamp method | 70 |

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials.

The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Straw Bales

Straw for straw bales shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications.

Straw bales shall be a minimum of 360 mm in width, 450 mm in height, 900 mm in length and shall have a minimum mass of 23 kg. The straw bale shall be composed entirely of vegetative matter, except for binding material.

Straw bales shall be bound by either wire, nylon or polypropylene string. Jute or cotton binding shall not be used. Baling wire shall be a minimum 1.57 mm in diameter. Nylon or polypropylene string shall be approximately 2 mm in diameter with 360 N of breaking strength.

Stakes

Stakes shall be wood or metal. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Wood stakes shall be a minimum 50 mm x 50 mm in size. Metal stakes may be used as an alternative, and shall be a minimum 13 mm in diameter. Stakes shall be a minimum 1.2 m in length. The tops of the metal stakes shall be bent at a 90-degree angle or capped with an orange or red plastic safety cap that fits snugly to the metal stake. The Contractor shall submit a sample of the metal stake and plastic cap, if used, for the Engineer's approval before installation.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

Signs

Wood posts for signs shall conform to the provisions in Section 56-2.02B, "Wood Posts," of the Standard Specifications. Lag screws shall conform to the provisions in Section 56-2.02D, "Sign Panel Fastening Hardware," of the Standard Specifications.

Plywood shall be freshly painted for each installation with not less than 2 applications of flat white paint. Sign letters shown on the plans shall be stenciled with commercial quality exterior black paint. Testing of paint will not be required.

INSTALLATION

Temporary concrete washout facilities shall be as follows:

1. Temporary concrete washout facilities shall be installed before beginning placement of concrete and located a minimum of 15 m from storm drain inlets, open drainage facilities, and water courses unless determined infeasible by the Engineer. Temporary concrete washout facilities shall be located away from construction traffic or access areas at a location determined by the Contractor and approved by the Engineer.
2. A sign shall be installed adjacent to each washout facility at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 56-2.03, "Construction," and Section 56-2.04, "Sign Panel Installation," of the Standard Specifications.
3. The length and width of a temporary concrete washout facility may be increased from the minimum dimensions shown on the plans upon approval of the Engineer.
4. Temporary concrete washout facilities shall be constructed in sufficient quantity and size to contain liquid and concrete waste generated by washout operations for concrete wastes. These facilities shall be constructed to contain liquid and concrete waste without seepage, spills, or overflow.
5. Berms for below grade temporary concrete washout facilities shall be constructed from compacted native material. Gravel may be used in conjunction with compacted native material.
6. A plastic liner shall be installed in below grade temporary concrete washout facilities.

Details for an alternative temporary concrete washout facility shall be submitted to the Engineer for approval at least 7 days before installation.

When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete and liquid residue shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Temporary concrete washout facilities 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.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 300 mm. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Holes, rips, and voids in the plastic liner shall be patched and repaired by taping or the plastic liner shall be replaced. The plastic liner shall be replaced when patches or repairs compromise the impermeability of the material as determined by the Engineer.

Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out.

Temporary concrete washout facilities shall be repaired or replaced on the same day the damage occurs. Damage to temporary concrete washout facilities resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary concrete washout facilities will be measured as units determined from actual count in place.

The contract unit price paid for temporary concrete washout facility shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing a temporary concrete washout facility, complete in place, including excavation and backfill, maintenance, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.09 TEMPORARY CHECK DAM

Temporary check dams shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary check dams shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary check dams.

Temporary check dams shall be either Type 1 (fiber roll) or Type 2 (gravel bag).

MATERIALS

Fiber Roll

Fiber rolls shall be one of the following:

1. Constructed with a premanufactured blanket consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. Rolls shall be between 200 mm and 250 mm in diameter, between 3 m and 6 m in length and shall weigh at least 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the rolls.

Stakes

Wood stakes shall be a minimum of 19 mm x 38 mm x 450 mm. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots or other defects which would render them unfit for the purpose intended. Metal stakes may be used as an alternative. The Contractor shall submit a sample of the metal stake for the Engineer's approval before installation. The tops of the metal stakes shall be bent at a 90-degree angle.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

Gravel-filled Bag

Gravel bag fabric shall be nonwoven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

| Specification | Requirements |
|-----------------------------------------------------------------------------------------------------------------------------|--------------|
| Mass per unit area, grams per square meter, min.
ASTM Designation: D 5261 | 270 |
| Grab tensile strength (25-mm grip), kilonewtons, min.
ASTM Designation: D4632* | 0.89 |
| Ultraviolet stability, percent tensile strength retained after 500 hours,
ASTM Designation: D4355, xenon arc lamp method | 70 |

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used in construction of the gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

INSTALLATION

Temporary check dams shall be installed as follows:

1. Temporary check dam (Type 1): Rope and notched stakes shall be used to restrain the fiber rolls against the surface of the unlined ditch or swale. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope so that the rope will hold the fiber roll tightly to the slope. Furrows will not be required. If metal stakes are used, the rope may be laced and knotted on the bend at the top of the metal stakes.

2. Temporary check dam (Type 2): A single layer of gravel bags shall be placed in lined ditches with ends abutted tightly and not overlapped.
3. The bedding area for the temporary check dam shall be cleared of obstructions including, rocks, clods, and debris greater than 25 mm in diameter before installation.
4. The temporary check dam shall be installed across and approximately perpendicular to the centerline of a ditch or drainage line.
5. The temporary check dam shall be installed with sufficient spillway depth to prevent flanking of concentrated flow around the ends of the check dam.
6. The temporary check dam shall be installed in an unlined ditch or swale before the application of other temporary erosion control or soil stabilization material in the same unlined ditch or swale.

Details for an alternative temporary check dam shall be submitted to the Engineer for approval at least 7 days before installation.

REMOVAL

When the temporary check dam is no longer required, as determined by the Engineer, it shall be removed and 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.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary check dam shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary check dams shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out. Locations where rills and other evidence of concentrated runoff have occurred beneath the check dams shall be corrected.

When sediment exceeds 1/3 of the height of the check dam above ground, or when directed by the Engineer, sediment shall be removed. The removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water.

Temporary check dams shall be repaired or replaced the same day damage occurs. Washouts or scour beneath the temporary check dam shall be repaired. Temporary check dams damaged during the progress of work or resulting from the Contractor's vehicles, equipment, or operations shall be repaired or replaced at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary check dams to be paid for will be determined by the meter measured along the centerline of the installed check dam.

The contract price paid per meter for temporary check dam shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary check dams, complete in place, including removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Temporary check dam disturbed or displaced by the Contractor's vehicles, equipment, or operations shall be reapplied at the Contractor's expense.

The cost of maintaining temporary check dam will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary check dam in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.10 TEMPORARY FIBER ROLL

Temporary fiber roll shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary fiber roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or nonactive.

Temporary fiber roll shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary fiber roll.

Temporary fiber roll shall be either Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh a minimum 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Temporary fiber roll shall be installed as follows:

1. Temporary fiber roll (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Temporary fiber roll (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Temporary fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Temporary fiber rolls shall be installed approximately parallel to the slope contour.
6. Temporary fiber rolls shall be installed before the application of other temporary erosion control or soil stabilization materials in the same area.

When no longer required, as determined by the Engineer, temporary fiber rolls shall be removed and 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. Temporary fiber rolls may be abandoned in place when approved in writing by the Engineer.

Ground disturbances including holes and depressions caused by the installation and removal of the temporary fiber roll shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Temporary fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of temporary fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where temporary fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for temporary fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary fiber rolls, complete in place, including furrow excavation and backfill and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to temporary fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

The cost of maintaining temporary fiber rolls will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary fiber rolls in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying half of that cost to the Contractor.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.11 TEMPORARY CHAIN LINK GATE

Temporary chain link gate shall be Type CL-1.8 conforming to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

Temporary gate shall be installed in existing fence at the location shown on the plans. Temporary gate installation shall be complete with gate post, latch post, concrete footings, braces, truss rods, and hardware. Temporary gate and latch posts shall be braced to the next existing line post as shown on the plans.

At the temporary gate location, an existing line post shall be removed and the temporary gate installed so that the gate is centered on the post hole of the removed post. Holes resulting from the removal of line posts shall be backfilled.

Temporary gate mounting and latching hardware shall not contain open-end slots for the fastening bolts.

Chain link fabric for temporary gate shall be of the same mesh size as the existing fence in which the temporary gate is installed.

Opening made in existing fence for installation of the temporary gate shall be closed during the working day in which the opening is made and when work is not in progress. Temporary closures shall be made with existing fence fabric or with additional 1.83-m chain link fabric as directed by the Engineer.

Upon completion of the modification of "DS ML233" the temporary gate shall be removed and replaced with chain link fence (Type CL-1.8) conforming to the provisions of Section 80, "Fences," of the Standard Specifications.

Full compensation for making the opening in existing fence, for temporary closing of the opening (including furnishing additional fence fabric if necessary), placing new fence, and for new posts, footings, hardware, braces, and truss rods shall be considered as included in the contract unit price paid for temporary chain link gate and no additional compensation will be allowed therefor.

10-1.12 TEMPORARY FENCE (TYPE ESA)

Temporary fence (Type ESA) shall be furnished, installed, maintained, and later removed in conformance with the details shown on the plans, as specified in these special provisions and as directed by the Engineer.

MATERIALS

Used materials may be installed provided the used materials conform to these special provisions. Materials for temporary fence (Type ESA) shall conform to the following:

High Visibility Fabric

High visibility fabric shall be machine produced, orange colored mesh manufactured from polypropylene or polyethylene. High visibility fabric may be made of recycled materials. Materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet resistant, shall be a minimum of 1.22 m in width with a maximum mesh opening of 50 mm x 50 mm. High visibility fabric shall be furnished in one continuous width and shall not be spliced to conform to the specified width dimension.

Posts

Posts for temporary fence (Type ESA) shall be of one of the following:

- A. Wood posts shall be fir or pine, shall have a minimum cross section of 50 mm x 50 mm, and a minimum length of 1.6 m. The end of the post to be embedded in the soil shall be pointed. Wood posts shall not be treated with wood preservative.
- B. Steel posts shall have a "U", "T", "L" or other cross sectional shape that resists failure by lateral loads. Steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.6 m. One end of the steel post shall be pointed and the other end shall have a high visibility colored top.

Fasteners

Fasteners for attaching high visibility fabric to the posts shall be as follows:

- A. The high visibility fabric shall be attached to wooden posts with commercial quality nails or staples, or as recommended by the manufacturer or supplier.
- B. Tie wire or locking plastic fasteners shall be used for attaching the high visibility fabric to steel posts. Maximum spacing of tie wire or fasteners shall be 600 mm along the length of the steel post.

INSTALLATION

Temporary fence (Type ESA) shall be installed as follows:

- A. All fence construction activities shall be conducted from outside the ESA as shown on the plans or as staked.
- B. Posts shall be embedded in the soil a minimum of 380 mm. Post spacing shall be 2.5 m maximum from center to center and shall at all times support the fence in a vertical position.
- C. Temporary fence (Type ESA) shall be constructed prior to clearing and grubbing work, shall enclose the foliage canopy (drip line) of protected plants, and shall not encroach upon visible roots of the plants.

When Type ESA temporary fence is no longer required, as determined by the Engineer, the temporary fence shall become the property of the Contractor and shall be removed and 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, except when reused as provided in this section.

Holes caused by the removal of temporary fence (Type ESA) shall be backfilled in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor the same day the damage occurs.

MEASUREMENT AND PAYMENT

Temporary fence (Type ESA) shall be measured and paid for in the same manner specified for permanent fence as provided in Section 80, "Fences," of the Standard Specifications.

Full compensation for maintaining, removing, and disposing of temporary fence (Type ESA) shall be considered as included in the contract price paid per meter for temporary fence (Type ESA) and no additional compensation will be allowed therefor.

10-1.13 TEMPORARY CONSTRUCTION ENTRANCE

Temporary construction entrances shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Temporary construction entrances shall be one of the water pollution control practices for tracking control. The SWPPP shall include the use of temporary construction entrances.
 Temporary construction entrances shall be Type 2.

MATERIALS

Temporary Entrance Fabric

Temporary entrance fabric shall be manufactured from polyester, nylon, or polypropylene material, or any combination thereof. Temporary entrance fabric shall be a nonwoven, needle-punched fabric, free of needles which may have broken off during the manufacturing process. Temporary entrance fabric shall be permeable and shall not act as a wicking agent.

Temporary entrance fabric shall be manufactured from virgin, recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Temporary entrance fabric shall conform to the following requirements:

| Specification | Requirements |
|-----------------------------------------------------------------------------------|--------------|
| Mass per unit area, grams per square meter, min.
ASTM Designation: D 5261 | 235 |
| Grab tensile strength (25-mm grip), kilonewtons, min.
ASTM Designation: D4632* | 0.89 |
| Elongation at break, percent min.
ASTM Designation: D4632* | 50 |
| Toughness, kilonewtons, min.
(percent elongation x grab tensile strength) | 53 |

* or appropriate test method for specific polymer

Rocks

Rocks shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for shape and for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

| Square Screen Size (mm) | Percentage Passing | Percentage Retained |
|-------------------------|--------------------|---------------------|
| 150 | 100 | 0 |
| 75 | 0 | 100 |

Corrugated Steel Panels

Corrugated steel panels shall be prefabricated and shall be pressed or shop welded, with a slot or hooked section to facilitate coupling at the ends of the panels.

INSTALLATION

Temporary construction entrances shall be installed as follows:

1. Before placing the temporary entrance fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation 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.
2. A sump shall be constructed within 6 m of each temporary construction entrance as shown on the plans.
3. Before placing the temporary entrance fabric, the ground shall be graded to a uniform plane. The relative compaction of the top 0.5-m shall be not less than 90 percent. The ground surface shall be free of sharp objects that may damage the temporary entrance fabric, and shall be graded to drain to the sump as shown on the plans.
4. Temporary entrance fabric shall be positioned longitudinally along the alignment of the entrance, as directed by the Engineer.
5. The adjacent ends of the fabric shall be overlapped a minimum length of 300 mm.

6. Rocks to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance.
7. During spreading of the rocks, vehicles or equipment shall not be driven directly on the fabric. A layer of rocks a minimum 150 mm thick shall be placed between the fabric and the spreading equipment to prevent damage to the fabric.
8. For Type 2 temporary construction entrances, a minimum of 6 coupled panel sections shall be installed for each temporary construction entrance. Before installing the panels, the ground surface shall be cleared of all debris to ensure uniform contact with the ground surface.

Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450-mm overlap on all edges.

Details for a proposed alternative temporary construction entrance or alternative sump shall be submitted to the Engineer for approval at least 7 days before installation. The Contractor may eliminate the sump if approved in writing by the Engineer.

When no longer required as determined by the Engineer, temporary construction entrances shall be removed and 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.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary construction entrance, including the sumps, shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities.

MAINTENANCE

The Contractor shall maintain temporary construction entrances throughout the contract or until removed. The Contractor shall prevent displacement or migration of the rock surfacing or corrugated steel panels. Significant depressions resulting from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer.

Temporary construction entrances shall be maintained to minimize tracking of soil and sediment onto existing public roads.

If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional corrugated steel panels and spread additional rocks to increase the capacity of the temporary construction entrance.

Temporary construction entrances shall be repaired or replaced on the same day the damage occurs. Damage to the temporary construction entrance resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of temporary construction entrances will be determined from actual count in place.

The contract unit price paid for temporary construction entrance shall include 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 excavation and backfill, and removal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The cost of maintaining the temporary construction entrance will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary construction entrance in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation or the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.14 MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)

Move-in/move-out (temporary erosion control) shall include moving onto the project when an area is ready to receive temporary erosion control or other hydraulically applied mulch materials as determined by the Engineer, setting up required personnel and equipment for the application of erosion control materials, and moving out all personnel and equipment when temporary erosion control in that area is completed. Temporary erosion control shall consist of any temporary soil stabilization practice specified elsewhere in these special provisions.

When areas are ready to receive applications of temporary erosion control, as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of being notified by the Engineer.

Attention is directed to the requirements of temporary erosion control specified elsewhere in these special provisions.

Quantities of move-in/move-out (temporary erosion control) will be determined as units from actual count. A move-in followed by a move-out will be considered one unit.

The contract unit price paid for move-in/move-out (temporary erosion control) shall include full compensation for furnishing all labor, materials (excluding temporary erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of temporary erosion control, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.15 TEMPORARY DRAINAGE INLET PROTECTION

Temporary drainage inlet protection shall be constructed, maintained, and removed at the locations shown on the approved Storm Water Pollution Prevention Plan (SWPPP) in accordance with "Water Pollution Control" of these special provisions, and in accordance with the details shown on the plans and these special provisions.

Temporary drainage inlet protection shall be one of the water pollution control practices for sediment control. The SWPPP shall include the use of temporary drainage inlet protection.

The Contractor shall select the appropriate drainage inlet protection in accordance with the details to meet the conditions around the drainage inlet. Throughout the duration of the contract, the Contractor shall provide protection to meet the changing conditions around the drainage inlet.

Temporary drainage inlet protection shall be Type 3A and 3B.

MATERIALS

Erosion Control Blanket

The erosion control blanket shall be a rolled erosion control product (RECP) and shall be classified either as temporary and degradable or long-term and nondegradable, and shall conform to one of the following:

A. Temporary and degradable:

1. Machine produced mats consisting of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The excelsior blanket shall be of consistent thickness with wood fiber evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with an extruded photodegradable plastic netting or lightweight nonsynthetic netting. The blanket shall be smolder resistant without the use of chemical additives and shall be nontoxic and noninjurious to plant and animal life. The excelsior blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m².
2. Machine produced mats consisting of 70 percent straw and 30 percent coconut fiber with an extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The straw and coconut shall adhere to the netting using thread or glue strip. The straw and coconut blanket shall be of consistent thickness, and straw and coconut fiber shall be evenly distributed over the entire area of the blanket. The straw and coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m².
3. Machine produced mats that are 100 percent coir consisting of coconut fiber with an extruded photodegradable plastic netting or lightweight nonsynthetic netting on the top and bottom surfaces of the blanket. The coconut fiber shall adhere to the netting using thread or glue strip. The coconut blanket shall be of consistent thickness, with coconut fiber evenly distributed over the entire area of the blanket. The coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27-kg/m².
4. Machine woven netting that is 100 percent spun coir consisting of coconut fiber with an average open area of 63 percent to 70 percent. Coconut coir netting shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m².

B. Long-term and nondegradable:

1. Geotextile blanket shall conform to the provisions for rock slope protection fabric (Type A) in Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for the Engineer's approval before installation.

Gravel-filled Bags

Gravel-filled bag fabric shall be nonwoven polypropylene geotextile or polymer material and shall conform to the following requirements:

| Specification | Requirements |
|-----------------------------------------------------------------------------------------------------------------------------|--------------|
| Mass per unit area, grams per square meter, minimum.
ASTM Designation: D 5261 | 270 |
| Grab tensile strength (25-mm grip), kilonewtons, minimum.
ASTM Designation: D4632* | 0.89 |
| Ultraviolet stability, percent tensile strength retained after 500 hours,
ASTM Designation: D4355, xenon arc lamp method | 70 |

* or appropriate test method for specific polymer

Gravel-filled bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

INSTALLATION

Temporary drainage inlet protection shall be installed at drainage inlets in paved and unpaved areas as follows:

- A. Temporary drainage inlet protection shall be installed such that ponded runoff does not encroach on the traveled way or overtop the curb or dike. Gravel-filled bags shall be placed to control ponding and prevent runoff from overtopping the curb or dike.
- B. The bedding area for the temporary drainage inlet protection shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
- C. A temporary linear sediment barrier shall be installed up-slope of the existing drainage inlet and parallel with the curb, dike, or flow line to prevent sediment from entering the drainage inlet.

Erosion Control Blanket and Geotextile Fabric

The erosion control blanket and geotextile fabric shall be secured to the surface of the excavated sediment trap with staples and embedded in a trench adjacent to the drainage inlet. The perimeter edge of the erosion control blanket and geotextile fabric shall be anchored in a trench.

Gravel-filled Bags

Gravel-filled bags shall be stacked to form a gravel bag barrier. The gravel-filled bags shall be placed so that the bags are tightly abutted and overlap the joints in adjacent rows. A spillway shall be created by removing one or more gravel-filled bags from the upper layer of the gravel bag barrier.

Gravel-filled bags shall only be used within shoulder areas when placed behind temporary railing (Type K).

MAINTENANCE

Temporary drainage inlet protection shall be maintained to provide sediment holding capacity and to reduce runoff velocities. Temporary drainage inlet protection shall be repaired or replaced immediately after the damage occurs.

Sediment deposits, trash, and debris shall be removed from temporary drainage inlet protection as needed or when directed by the Engineer. Removed sediment shall be deposited within the project limits so that the sediment is not subject to erosion by wind or by water. Trash and debris shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

At locations where rills and other evidence of concentrated runoff have occurred beneath the drainage inlet protection, the protection shall be adjusted to prevent another occurrence.

Sediment in excess of 50 mm above the surface of the erosion control blanket or geotextile fabric shall be removed. Sediment deposits shall be removed when the deposit is 1/3 the height of the gravel bag barrier or one half the height of the spillway; whichever is less. Gravel-filled bags shall be replaced when the bag material ruptures or when the binding fails.

REMOVAL

When the temporary drainage inlet protection is no longer required the protection materials shall be removed and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Holes, depressions, or other ground disturbance caused by the removal of the temporary drainage inlet protection shall be backfilled and repaired in accordance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MEASUREMENT

Quantities of temporary drainage inlet protection will be determined from actual count in place. The protection will be measured one time only and no additional measurement will be recognized.

PAYMENT

The contract unit price paid for temporary drainage inlet protection shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary drainage inlet protection, complete in place, including removal of materials, including cleanup and disposal of retained sediment and debris, and backfilling and repairing holes, depressions and other ground disturbance, 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 drainage inlet protection changes during the course of construction.

The cost of maintaining temporary drainage inlet protection will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost of maintaining temporary drainage inlet protection in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost.

Cleanup, repair, removal, disposal, or replacement due to improper installation, or as a result of the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.16 COOPERATION

Attention is directed to Section 7-1.14, "Cooperation," and Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

It is anticipated that work by other contractors may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

| Contract No. | Co-Rte-KP | Location In | Type of Work To |
|---------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Caltrans
Contract No.
11-2T0924 | SD-163, 15-
16.1/R18.8,M16.7/M34.1 | San Diego County in San Diego on Route 15 from 0.3 km south of Route 52/15 Separation to 0.1 km north of Carmel Mountain Road Overcrossing and on Route 163 from 0.6 km north 163/52 Separation to Route 163/15 Separation | Construct Managed Lanes, South Segment 2 |
| SANDAG
Contract
No. 5000680 | 11-15-16.7/50.7 | San Diego County in and near San Diego from Route 52/15 Separation and in and near Escondido to Route 78 | Install I-15 Managed Lanes Toll Collection System Integration |

Consecutive on-ramp or off-ramps in the same direction of travel shall not be closed simultaneously unless otherwise provided in these special provisions or permitted by the Engineer.

10-1.17 PROGRESS SCHEDULE (CRITICAL PATH METHOD)

The Contractor shall submit to the Engineer practicable critical path method (CPM) progress schedules in conformance with these special provisions. Whenever the term "schedule" is used in this section it shall mean CPM progress schedule.

Attention is directed to "Payments" of Section 5 of these special provisions.

The provisions in Section 8-1.04, "Progress Schedule," of the Standard Specifications shall not apply.

DEFINITIONS

The following definitions shall apply to this section:

- A. **ACTIVITY.**—A 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.
- B. **BASELINE SCHEDULE.**—The initial schedule representing the Contractor's work plan on the first working day of the project.
- C. **CONTRACT COMPLETION DATE.**—The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications.
- D. **CRITICAL PATH.**—The 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 will extend the scheduled completion date.
- E. **CRITICAL PATH METHOD (CPM).**—A network based planning technique using activity durations and the relationships between activities to mathematically calculate a schedule for the entire project.
- F. **DATA DATE.**—The 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."
- G. **EARLY COMPLETION TIME.**—The difference in time between an early scheduled completion date and the contract completion date.
- H. **FLOAT.**—The difference between the earliest and latest allowable start or finish times for an activity.
- I. **MILESTONE.**—An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.
- J. **NARRATIVE REPORT.**—A document submitted with each schedule that discusses topics related to project progress and scheduling.
- K. **NEAR CRITICAL PATH.**—A chain of activities with total float exceeding that of the critical path but having no more than 10 working days of total float.
- L. **SCHEDULED COMPLETION DATE.**—The planned project finish date shown on the current accepted schedule.
- M. **STATE OWNED FLOAT ACTIVITY.**—The activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.
- N. **TIME IMPACT ANALYSIS.**—A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.
- O. **TOTAL FLOAT.**—The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.
- P. **UPDATE SCHEDULE.**—A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

GENERAL REQUIREMENTS

The Contractor shall submit to the Engineer baseline, monthly update and final update schedules, each consistent in all respects with the time and order of work requirements of the contract. The project work shall be executed in the sequence indicated on the current accepted schedule.

Schedules shall show the order in which the Contractor proposes to carry out the work with logical links between time-scaled work activities, and calculations made using the critical path method to determine the controlling operation or operations. The Contractor is responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

The Contractor shall produce schedules using computer software and shall furnish compatible software for the Engineer's exclusive possession and use. The Contractor shall furnish network diagrams, narrative reports, tabular reports and schedule data as parts of each schedule submittal.

Schedules shall include, but not be limited to, activities that show the following that are applicable to the project:

- A. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion.
- B. Project start date, scheduled completion date and other milestones.
- C. Work performed by the Contractor, subcontractors and suppliers.
- D. Submittal development, delivery, review and approval, including those from the Contractor, subcontractors and suppliers.
- E. Procurement, delivery, installation and testing of materials, plants and equipment.
- F. Testing and settlement periods.
- G. Utility notification and relocation.
- H. Erection and removal of falsework and shoring.
- I. Major traffic stage switches.
- J. Finishing roadway and final cleanup.
- K. State-owned float as the predecessor activity to the scheduled completion date.

Schedules shall have not less than 50 and not more than 2,000 activities, unless otherwise authorized by the Engineer. The number of activities shall be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.

Schedule activities shall include the following:

- A. A clear and legible description.
- B. Start and finish dates.
- C. A duration of not less than one working day, except for event activities, and not more than 20 working days, unless otherwise authorized by the Engineer.
- D. At least one predecessor and one successor activity, except for project start and finish milestones.
- E. Required constraints.
- F. Codes for responsibility, stage, work shifts, location and contract pay item numbers.

The Contractor may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time shall be considered a resource for the exclusive use of the Contractor. The Contractor 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. The Contractor may also submit for approval a cost reduction incentive proposal in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

The Contractor may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. The Contractor shall provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float shall be 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. The Contractor shall prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action in conformance with the provisions in "Time Impact Analysis" specified herein. The Engineer will document State-owned float by directing the Contractor to update the State-owned float activity on the next update schedule. The Contractor shall 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, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall prepare a time impact analysis to determine the effect of the change in conformance with the provisions in "Time Impact Analysis" specified herein, and shall include the impacts acceptable to the Engineer in the next update 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 one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules shall not waive any contract requirements and shall not relieve the Contractor of any obligation thereunder or responsibility for submitting complete and accurate information. Schedules that are rejected shall be corrected by the Contractor and resubmitted to the Engineer within 5 working days of notification by the Engineer, at which time a new review period of one week will begin.

Errors or omissions on schedules shall not relieve the Contractor 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 the Contractor or the Engineer

discover that any aspect of the schedule has an error or omission, it shall be corrected by the Contractor on the next update schedule.

EQUIPMENT AND SOFTWARE

The Contractor shall provide for the State's exclusive possession and use a complete computer system specifically capable of creating, storing, updating and producing CPM schedules utilizing the latest hardware and software technology. Before delivery and setup of the computer system, the Contractor shall submit to the Engineer for approval a detailed list of all computer hardware and software the Contractor proposes to furnish. The minimum software and computer system to be furnished shall include the following:

- A. A complete computer system, including keyboard, mouse, 610-mm color SVGA flat LCD monitor (1,024x768 pixels), current Intel Pentium IV micro processor chip, or equivalent;
- B. Computer operating system software, compatible with the selected processing unit, for Windows XP Pro 2002, or equivalent;
- C. Minimum one gigabyte (1000 MB) of random access memory (RAM), or equivalent;
- D. A 160 gigabyte minimum hard disk drive, a 1.44 megabyte 90-mm floppy disk drive, 32x speed minimum CD/DVD-RW drive, Ethernet card, two UBCUSB ports, and 56K modem;
- E. A color-ink-jet plotter with a minimum 64 Megabyte RAM, capable of 600 dots per inch color, 1200 x 600 dots per inch monochrome, or equivalent. Capable of printing fully legible, time scaled charts, and network diagrams, in four colors, with a minimum size of 914-mm by 1219-mm (E size) and is compatible with the selected system. Plotter paper and ink cartridges will be provided throughout the contract. Plotter shall be HP Designjet 1055cm Plus or equivalent;
- F. CPM software shall be the latest version of Primavera Project Planner (P3) unless otherwise accepted by the Engineer;
- G. Scheduler Analyzer Pro or equivalent – a suite of programs to assist in the schedule analysis, the latest version for Windows XP Pro 2002, or later and;
- H. Microsoft Office software, the latest version for Windows XP Pro 2002, or later, and McAfee Virus software or equivalent.

The computer hardware and software furnished shall be compatible with that used by the Contractor for the production of the CPM progress schedule required by the Contract, and shall include original instruction manuals and other documentation normally provided with the hardware, software and plotter.

The Contractor shall furnish, install, set up, provide licenses for all the software programs, maintain and repair the computer hardware and plotter, and provide software support ready for use at a location determined by the Engineer. The hardware and software shall be installed and ready for use by the first submission of the baseline schedule. The Contractor shall provide 24 hours of formal training for the Engineer and three other agents of the Department designated by the Engineer, in the use of the hardware and software to include schedule analysis, reporting and resource allocations. An authorized vendor of Primavera Project Planner shall perform the training.

The Department will compensate the Contractor in conformance with the provisions in Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software if the original software is damaged, lost or stolen after delivery to the Engineer.

All computer hardware and plotter furnished shall remain the property of the Contractor and shall be removed by the Contractor upon acceptance of the contract when no claims involving contract progress are pending. The furnished schedule software shall become the property of the Department and will not be returned to the Contractor. When claims involving contract progress are pending, computer hardware shall not be removed until final estimate has been submitted to the Contractor.

NETWORK DIAGRAMS, REPORTS AND DATA

The Contractor shall include the following for each schedule submittal:

- A. Two sets of originally plotted, time-scaled network diagrams.
- B. Two copies of a narrative report.
- C. Two copies of each of 3 sorts of the CPM software-generated tabular reports.
- D. One 1.44-megabyte 90 mm (3.5 inch) floppy diskette containing the schedule data.

The time-scaled network diagrams shall conform to the following:

- A. Show a continuous flow of information from left to right.

- B. Be based on early start and early finish dates of activities.
- C. Clearly show the primary paths of criticality using graphical presentation.
- D. Be prepared on E-size sheets, 860 mm x 1120 mm (34 inch x 44 inch).
- E. Include a title block and a timeline on each page.

The narrative report shall be organized in the following sequence with all applicable documents included:

- A. Contractor's transmittal letter.
- B. Work completed during the period.
- C. 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.
- D. Description of the current critical path.
- E. Changes to the critical path and scheduled completion date since the last schedule submittal.
- F. Description of problem areas.
- G. Current and anticipated delays:
 - 1. Cause of delay.
 - 2. Impact of delay on other activities, milestones and completion dates.
 - 3. Corrective action and schedule adjustments to correct the delay.
- H. Pending items and status thereof:
 - 1. Permits
 - 2. Change orders
 - 3. Time adjustments
 - 4. Non-compliance notices
- I. Reasons for an early or late scheduled completion date in comparison to the contract completion date.

Tabular reports shall be software-generated and provide information for each activity included in the project schedule. Three different reports shall be sorted by (1) activity number, (2) early start and (3) total float. Tabular reports shall be 215 mm x 280 mm (8 1/2 inch x 11 inch) in size and shall include, as a minimum, the following applicable information:

- A. Data date
- B. Activity number and description
- C. Predecessor and successor activity numbers and descriptions
- D. Activity codes
- E. Scheduled, or actual and remaining durations (work days) for each activity
- F. Earliest start (calendar) date
- G. Earliest finish (calendar) date
- H. Actual start (calendar) date
- I. Actual finish (calendar) date
- J. Latest start (calendar) date
- K. Latest finish (calendar) date
- L. Free float (work days)
- M. Total float (work days)
- N. Percentage of activity complete and remaining duration for incomplete activities.
- O. Lags
- P. Required constraints

Schedule submittals will only be considered complete when all documents and data have been provided as described above.

PRE-CONSTRUCTION SCHEDULING CONFERENCE

The Contractor shall schedule and the Engineer will conduct a pre-construction scheduling conference with the Contractor's project manager and construction scheduler within 10 working days of the approval of the contract. At this meeting the Engineer will review the requirements of this section of the special provisions with the Contractor.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. If the Contractor proposes deviations to the construction staging of the project, then the general time-scaled logic diagram shall also display the deviations and resulting time impacts. The Contractor shall be prepared to discuss the proposal.

At this meeting, the Contractor shall additionally submit the alphanumeric coding structure and the activity identification system for labeling the work activities. To easily identify relationships, each activity description shall 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 will review the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to the Contractor for implementation.

BASELINE SCHEDULE

Beginning the week following the pre-construction scheduling conference, the Contractor shall meet with the Engineer weekly until the baseline schedule is accepted by the Engineer to discuss schedule development and resolve schedule issues.

The Contractor shall submit to the Engineer a baseline schedule within 20 working days of approval of the contract. The Contractor shall allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal will not be considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule shall include the entire scope of work and how the Contractor plans to complete all work contemplated. The baseline schedule shall show the activities that define the critical path. Multiple critical paths and near-critical paths shall be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities shall be critical or near critical, unless otherwise authorized by the Engineer.

The baseline schedule shall not extend beyond the number of working days specified in these special provisions. The baseline schedule shall have a data date of the first working day of the contract and not include any completed work to date. The baseline schedule shall not attribute negative float or negative lag to any activity.

If the Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall 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 shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

UPDATE SCHEDULE

The Contractor shall submit an update schedule and meet with the Engineer to review contract progress, on or before the first day of each month, beginning one month after the baseline schedule is accepted. The Contractor shall allow 2 weeks for the Engineer's review after the update schedule and all support data are submitted, except that the review period shall not start until the previous month's required schedule is accepted. Update schedules that are not accepted or rejected within the review period will be considered accepted by the Engineer.

The update schedule shall have a data date of the twenty-first day of the month or other date established by the Engineer. The update schedule shall 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 shall be shown as applicable. Durations for work that has been completed shall be shown on the update schedule as the work actually occurred, including Engineer submittal review and Contractor resubmittal times.

The Contractor 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. The Contractor shall state 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 the Contractor shall submit a time impact analysis as described herein.

DESIGN SEQUENCING

The dates specified in Section 1, "Specifications and Plans," of these special provisions, on which the Contractor will be provided the complete design of each project phase, shall be shown as milestones in the baseline schedule, and in subsequent updated and revised schedules.

At the completion of the design for each project phase, the schedule shall be updated showing the actual date the final plans, specifications and estimate of quantities for that phase were provided to the Contractor.

TIME IMPACT ANALYSIS

The Contractor shall submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall 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 shall be equal to the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

The Contractor shall submit a TIA in duplicate within 15 working days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 2 weeks after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.

If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 15 days from the meeting with the Engineer to give notice in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule. The Engineer will withhold remaining payment on the schedule contract item if a TIA is requested by the Engineer and not submitted by the Contractor within 15 working days. The schedule item payment will resume on the next estimate after the requested TIA is submitted. No other contract payment will be retained regarding TIA submittals.

FINAL UPDATE SCHEDULE

The Contractor shall submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's project manager and 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.

RETENTION

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during each estimate period in which the Contractor fails to submit an acceptable schedule conforming to the requirements of these special provisions as determined by the Engineer. Schedule retentions will be released for payment on the next monthly estimate for partial payment following the date that acceptable schedules are submitted to the Engineer or as otherwise specified herein. Upon completion of all contract work and submittal of the final update schedule and certification, any remaining retained funds associated with this section, "Progress Schedule (Critical Path Method)", will be released for payment. Retentions held in conformance with this section shall be in addition to other retentions provided for in the contract. No interest will be due the Contractor on retention amounts.

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) shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, and for doing all the work involved in preparing, furnishing, and updating schedules, and instructing and assisting the Engineer in the use of computer software, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) contract item will be made progressively as follows:

- A. A total of 25 percent of the item amount or a total of 25 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon achieving all of the following:
 1. Completion of 5 percent of all contract item work.

2. Acceptance of all schedules and TIAs required to the time when 5 percent of all contract item work is complete.
 3. Delivery of schedule software to the Engineer.
 4. Completion of required schedule software training.
- B. A total of 50 percent of the item amount or a total of 50 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 25 percent of all contract item work is complete.
- C. A total of 75 percent of the item amount or a total of 75 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 50 percent of all contract item work is complete.
- D. A total of 100 percent of the item amount or a total of 100 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of all contract item work, acceptance of all schedules and TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If the Contractor fails to complete any of the work or provide any of the schedules required by this section, the Engineer shall make an adjustment in compensation in conformance with the provisions 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 furnishing schedules.

10-1.18 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 9-1.08, "Adjustment of Overhead Costs," 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 cost reduction incentive proposals accepted and executed in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," 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 Engineer's Estimate, 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 Engineer's Estimate, 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 9-1.03B, "Work Performed by Special Forces or Other Special Services," 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 Engineer's Estimate 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 extensions of time in conformance with the provisions of the third paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications.
 - 4. Other suspensions that mutually benefit the State and the Contractor.
- B. Extensions of contract time granted by the State in conformance with the provisions in the fifth paragraph in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.
- C. Reductions in contract time set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

Delays to the controlling operation are categorized as three types: nonexcusable, excusable, or compensable. An accepted progress schedule and approved time impact analysis, as submitted by the Contractor in conformance with "Progress Schedule (Critical Path Method)" of these special provisions, determine the types and durations of delays.

Nonexcusable delay is caused by the fault or performance deficiency of the Contractor, subcontractors at any tier, or suppliers, and no extension of time or additional compensation of loss is allowed. Excusable delay is caused by factors beyond the control and without the fault of the State or the Contractor, and the Contractor is only entitled to an extension of time and no compensation of loss. Compensable delay is caused by the error or omission of the State, and the Contractor is entitled to both an extension of time and compensation of loss. Concurrent delay occurs when two separate delays overlap

partially or entirely. Nonexcusable delays concurrent with either excusable or compensable delays are nonexcusable delays. Excusable delays concurrent with compensable delays are excusable delays.

The quantity of time-related overhead will only be adjusted as a result of compensable delays and will not be adjusted as a result of either nonexcusable or excusable delays.

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 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 partial payments pursuant to the provisions in Section 9-1.06, "Partial 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 acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," 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 acceptance of the contract in conformance with the provisions in Section 9-1.07, "Payment After Acceptance," of the Standard Specifications.

10-1.19 OBSTRUCTIONS

Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to the existence of certain underground facilities that may require special precautions be taken by the Contractor to protect the health, safety and welfare of workers and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine, and toxic or flammable gases; natural gas in pipelines greater than 150 mm in diameter or pipelines operating at pressures greater than 415 kPa (gage); underground electric supply system conductors or cables, with potential to ground of more than 300 V, either directly buried or in a duct or conduit which do not have concentric grounded or other effectively grounded metal shields or sheaths.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include, but are not limited to, the following:

| Notification Center | Telephone Number |
|-----------------------------------------------------|----------------------------------|
| Underground Service Alert-Northern California (USA) | 1-800-642-2444
1-800-227-2600 |
| Underground Service Alert-Southern California (USA) | 1-800-422-4133
1-800-227-2600 |

10-1.20 MOBILIZATION

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications.

10-1.21 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 45 kg) 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 days before beginning any work using the devices or within 2 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 kilometer post 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 45 kg) 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/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 days before beginning any work using the devices or within 2 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 45 kg 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/HighwaySafe.htm

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.

10-1.22 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 "Traffic Plastic Drums" of these special provisions regarding option to use traffic plastic drums instead of portable delineators, tubular markers, cones, and Type I and Type II barricades.

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.

Orange background on construction area signs shall be fluorescent orange.

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 working days, but not more than 14 calendar 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-Northern California (USA) | (800) 642-2444
(800) 227-2600 |
| Underground Service Alert-Southern California (USA) | (800) 422-4133
(800) 227-2600 |

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 100 mm greater than the longer dimension of the post cross-section.

Construction area signs placed within 4.6 m 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.

10-1.23 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, "Public Safety" of these special provisions and these special provisions.

Attention is directed to "Traffic Plastic Drums" of these special provisions regarding the use of plastic drums in place of portable delineators, cones or Type I or II barricades.

Closure is defined as the closure of a traffic lane or lanes, ramp or connector lanes, within a single traffic control system.

Closures shall conform to the provisions in "Traffic Control System for Lane Closure" of these special provisions.

At locations where falsework pavement lighting or pedestrian openings through falsework are designated, falsework lighting shall be installed in conformance with the provisions in Section 86-6.11, "Falsework Lighting," of the Standard Specifications.

Openings shall be provided through bridge falsework for the use of public traffic at each location where falsework is constructed over the streets or routes listed in the following table. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of falsework lighting, if required for each opening, shall conform to the requirements in the table. The width of vehicular openings shall be the clear width between temporary railings or other protective work. The spacing shown for falsework pavement lighting is the maximum distance center to center in meters between fixtures.

POMERADO ROAD (PONY BENT)
(Bridge No. 57-0909)

| | Number | Width | Height |
|-----------------------------|----------|-------|----------------------|
| Vehicle Openings | 1 | 7.2 | 4.6 |
| | Location | | Spacing |
| Falsework Pavement Lighting | R and L | | 12 staggered ½ space |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

At the following location, no temporary railing is required.

DS ML233 Modification

| | Number | Width | Height |
|---------------------|--------|-------|--------|
| Pedestrian Openings | 1 | 2.44 | 2.74 |

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)

The exact location of openings will be determined by the Engineer.

Closures are only allowed during the hours shown in the lane requirement charts included in this section "Maintaining Traffic," 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 when construction operations are not actively in progress.

Closure of two consecutive on-ramps or off-ramps in the same direction of travel will not be permitted simultaneously unless directed by the Engineer.

The Contractor shall furnish special portable freeway detour signs as shown on the plans to be used on the detour routes as directed by the Engineer.

SC6-4(CA) (RAMP CLOSED) sign shall be used to inform motorists of the temporary closing of a connector, entrance ramp or exit ramp for more than one business day.

The SC6-4(CA) signs shall be installed at least 3 days before closing the connector or ramp, but not more than 14 days before the connector or ramp closure. The Contractor shall notify the Engineer at least 5 calendar days before installing the SC6-4(CA) signs. The SC6-4(CA) signs shall be stationary mounted at locations shown on the plans and as directed by the Engineer.

Accurate information shall be maintained on the SC6-4(CA) signs. The SC6-4(CA) signs, when no longer required, shall be immediately covered or removed.

Freeways may be closed only if signed for closing 3 days in advance. The Contractor shall notify the Engineer not less than 5 calendar days prior to signing the freeway. If the freeway is not closed on the posted day, the closure shall be changed to allow 3 days advance notice before closure.

Freeway closure charts are for the erection and removal of falsework and placement and removal of overhead sign bridges and other work as approved in writing by the Engineer.

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 on the shoulder within 1.8 m of a traffic lane, 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.

When complete freeway, expressway or conventional highway closure is required, only one detour for each direction of travel will be allowed for the following operations: Erection of Overhead Signs.

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.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the ramp closure (advance notice) signs and freeway detour 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.

| Lane Closure Restriction for Designated Legal Holidays | | | | | | | | | | |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|-----|-----|
| Thu | Fri | Sat | Sun | Mon | Tues | Wed | Thu | Fri | Sat | Sun |
| x | H
xx | xx | xx | | | | | | | |
| x | xx | H
xx | xx | | | | | | | |
| | x | xx | H
xx | xx | | | | | | |
| | x | xx | xx | H
xx | | | | | | |
| | | | | x | H
xx | | | | | |
| | | | | | x | H
xx | | | | |
| | | | | | | x | H
xx | xx | | xx |
| Legends: | | | | | | | | | | |
| | Refer to lane closure charts | | | | | | | | | |
| x | The full width of the traveled way shall be open for use by public traffic after 0500. | | | | | | | | | |
| xx | The full width of the traveled way shall be open for use by public traffic. | | | | | | | | | |
| H | Designated Legal Holiday | | | | | | | | | |
| REMARKS: This table is to be used concurrently with all charts except Charts 4 and 20. | | | | | | | | | | |

| Chart No. 1
Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------------------------------------------------------|--|--|--|--|------------------------|---|---|---|---|---|---|---|---|---|-------------------------------------------|--|--|--|--|--|--|--|--|--|--|---|---|---|---|---|
| County: SD | | | | | Route/Direction: 15/NB | | | | | | | | | | KP: R17.20 / M24.14
PM:R10.687/M14.999 | | | | | | | | | | | | | | | |
| Closure Limits: 0.1 km S. of Rte 52 to 0.1 km S. of Carroll Canyon Rd OC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 through Thursdays | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | 3 | 3 | 2 | 2 | 1 |
| Fridays | | | | | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | | | | | 1 | 1 | 2 | 3 | 3 | | | | | | | | | | | | | | | | | | |
| Sundays | | | | | | | | 1 | 1 | 1 | 2 | 2 | 3 | 3 | | | | | | | | | | | | 3 | 2 | 2 | 1 | |
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Provide at least three adjacent through freeway lanes open in direction of travel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No work permitted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 2
Freeway/Expressway Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------------------------------------------------------|--|--|--|--|------------------------|---|---|---|---|---|---|---|---|---|-----------------------------------------|--|--|--|--|--|--|--|--|--|--|--|---|---|---|---|---|
| County: SD | | | | | Route/Direction: 15/SB | | | | | | | | | | KP: M24.14/R17.20
PM:M14.999/R10.687 | | | | | | | | | | | | | | | | |
| Closure Limits: 0.1 km S. of Carroll Canyon Rd OC to 0.1 km S. of Rte 52 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 through Thursdays | | | | | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | 3 | 2 | 2 | 1 |
| Fridays | | | | | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | | | | | 1 | 1 | 2 | 3 | 3 | | | | | | | | | | | | | | | | | | | |
| Sundays | | | | | | | | 1 | 1 | 1 | 2 | 2 | 3 | 3 | | | | | | | | | | | | | 3 | 2 | 2 | 1 | |
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Provide at least three adjacent through freeway lanes open in direction of travel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No work permitted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

**Chart No. 3
Freeway/Expressway Lane Requirements**

| | | |
|------------|-------------------------|--------------------------------------------|
| County: SD | Route/Direction: 163/SB | KP: R18.76 / R18.28
PM:R11.656/ R11.358 |
|------------|-------------------------|--------------------------------------------|

Closure Limits: JCT RTE 15 to 0.8 km N of Kearny Villa Rd OC

| 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 through Thursdays | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | | | | | | 2 | 2 | 2 |
| Fridays | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | | | | | |
| Sundays | | | | 2 | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | | 2 | 2 | 2 |

Legend:

- Provide at least two adjacent through freeway lanes open in direction of travel
- No work permitted

REMARKS:

**Chart No. 4
Complete Ramp Closure Hours/Ramp Lane Requirements**

| | | |
|------------|------------------------|----------------------------|
| County: SD | Route/Direction: 15/NB | KP: M22.925 PM: M14.244 |
|------------|------------------------|----------------------------|

Closure Limits: NB On-ramp from EB Miramar Rd

| 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 through Thursdays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Fridays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Saturdays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Sundays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |

Legend:

| | |
|---|-------------------------------|
| C | Ramp may be closed completely |
| | No work permitted |

REMARKS:

This chart not to be used in conjunction with Charts 5, 12, 14, 15.

This chart to be used for six (6) weeks only.

Primary and secondary detours must be used concurrently.

This chart shall not be used during the Marine Corps Air Station Air Show.

1. Primary Detour: Detour EB Miramar Rd to NB Rte 15
 Detour EB Miramar Rd to NB Rte 15 traffic via easterly on Miramar Rd to SB 15 On-ramp from EB Miramar Rd. thence southerly on Rte 15 to SB 15 Off-ramp to EB Miramar Way thence easterly Miramar Way to NB Rte 15.

When the ramp is closed, Place a PCMS (Portable Changeable Message Sign) on EB Miramar Rd west of Kearny Villa Rd, warning traffic of the NB Rte 15 On-ramp closure/detour ahead.

2. Secondary Detour: Detour EB Miramar Rd to NB Rte 15
 Detour EB Miramar Rd to NB Rte 15 traffic via easterly on Miramar Rd to Pomerado Rd thence easterly on Pomerado Rd to NB Scripps Ranch Blvd thence northerly on Scripps Ranch Blvd to WB Carroll Canyon Rd thence westerly on Carroll Canyon Rd to NB Rte 15.

**Chart No. 7
Complete Ramp Closure Hours/Ramp Lane Requirements**

County: SD Route/Direction: 15/NB KP: M23.221 PM: M14.428

Closure Limits: NB On-ramp from WB Pomerado Rd

| 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 through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | C | C | C |
| Fridays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | C | C | C | C | C | C | C | C | | | | | | | | | | | | | | | |
| Sundays | | | | C | C | C | C | C | C | C | C | | | | | | | | | | | | | C | C | C |

Legend:

C Ramp may be closed completely

No work permitted

REMARKS:

Chart No. 8
Complete Ramp Closure Hours/Ramp Lane Requirements

| | | | |
|------------|------------------------|----------------------------|----------------------------|
| County: SD | Route/Direction: 15/NB | KP: M22.925
KP: M23.221 | PM: M14.245
PM: M14.429 |
|------------|------------------------|----------------------------|----------------------------|

Closure Limits: NB On-ramp from EB Miramar Rd
 NB On-ramp from WB Pomerado Rd

| 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 through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | | |
| Fridays | | | | | | | | | | | | | | | | | | | | | | | | C | C | C |
| Saturdays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | |
| Sundays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | |

Legend:

C Ramp may be closed completely

No work permitted

REMARKS:

This chart not to be used in conjunction with Charts 5, 12, 14, 15.

This chart to be used for two (2) weekends only.

Primary and secondary detours must be used concurrently.

1. Primary Detour: Detour EB Miramar Rd to NB Rte 15
 Detour EB Miramar Rd to NB Rte 15 traffic via easterly on Miramar Rd to SB 15 On-ramp from EB Miramar Rd. thence southerly on Rte 15 to SB 15 Off-ramp to EB Miramar Way thence easterly Miramar Way to NB Rte 15.
2. Secondary Detour: Detour EB Miramar Rd to NB Rte 15
 Detour EB Miramar Rd to NB Rte 15 traffic via easterly on Miramar Rd to Pomerado Rd thence easterly on Pomerado Rd to NB Scripps Ranch Blvd thence northerly on Scripps Ranch Blvd to WB Carroll Canyon Rd thence westerly on Carroll Canyon Rd to NB Rte 15.

When the ramp is closed, Place a PCMS (Portable Changeable Message Sign) on EB Miramar Rd west of Kearny Villa Rd, warning traffic of the NB Rte 15 On-ramp closure/detour ahead.

3. Detour WB Pomerado Rd to NB Rte 15
 Detour WB Pomerado Rd to NB Rte 15 traffic via westerly on Pomerado Rd to WB Miramar Rd thence westerly on Miramar Rd to NB Kearny Villa Rd thence northerly on Kearny Villa Rd to EB Carroll Canyon Rd thence easterly on Carroll Canyon Rd to NB Rte 15.

When the ramp is closed, Place a PCMS (Portable Changeable Message Sign) on WB Pomerado Rd east of Scripps Ranch Blvd, warning traffic of the NB RTE 15 On-ramp closure/detour ahead.

| Chart No. 9 | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|---|------------------------|---|---|---|---|---|----|----|----|----|-------------------------|----|----|----|----|----|----|----|----|----|----|---|
| Complete Ramp Closure Hours/Ramp Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | |
| County: SD | | | | | Route/Direction: 15/NB | | | | | | | | | | KP: M23.887 PM: M14.843 | | | | | | | | | | | |
| Closure Limits: NB Off-ramp to Carroll Canyon Rd | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | | |
| Fridays | | | | | | | | | | | | | | | | | | | | | | | | C | C | C |
| Saturdays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Sundays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> C Ramp may be closed completely | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> No work permitted | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | |
| This chart not to be used in conjunction with Chart 15. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| This chart to be used for two (2) weekends only. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Detour NB Rte 15 to Carroll Canyon Rd
Detour NB Rte 15 to Carroll Canyon Rd traffic via northerly on Rte 15 to NB Rte 15 Off-ramp to Mira Mesa Blvd thence easterly on Mira Mesa Blvd to SB Scripps Ranch Blvd thence southerly on Scripps Ranch Blvd to Carroll Canyon Rd. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| When the ramp is closed, Place a PCMS (Portable Changeable Message Sign) on NB RTE 15 South of Miramar Rd/ Pomerado Rd, warning traffic of the NB RTE 15 Off-ramp closure/detour ahead. | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Chart No. 10 | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------------------------------|----|---|---|---|------------------------|---|---|---|---|---|----|----|----|----|-------------------------|----|----|----|----|----|----|----|----|----|----|---|
| Complete Ramp Closure Hours/Ramp Lane Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | |
| County: SD | | | | | Route/Direction: 15/NB | | | | | | | | | | KP: M22.925 PM: M14.245 | | | | | | | | | | | |
| Closure Limits: NB On-ramp from EB Miramar Rd | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | C | C | C |
| Fridays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | C | C | C | C | C | C | C | C | C | | | | | | | | | | | | | | |
| Sundays | | | | C | C | C | C | C | C | C | C | C | C | | | | | | | | | | C | C | C | |
| Legend: | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> C Ramp may be closed completely | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> No work permitted | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMARKS: | | | | | | | | | | | | | | | | | | | | | | | | | | |

| <p align="center">Chart No. 11
 Complete Ramp Closure Hours/Ramp Lane Requirements</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|------------------------|---|---|---|---|---|---|---|---|---|-------------------------|---|---|--|--|--|--|--|--|--|--|---|---|---|
| County: SD | | | | | Route/Direction: 15/NB | | | | | | | | | | KP: M23.887 PM: M14.843 | | | | | | | | | | | | | |
| Closure Limits: NB Off-ramp to Carroll Canyon Rd | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 through Thursdays | | | | | C | C | C | C | C | | | | | | | | | | | | | | | | | C | C | C |
| Fridays | | | | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | | | | | C | C | C | C | C | C | C | C | | | | | | | | | | | | | |
| Sundays | | | | | | | | C | C | C | C | C | C | C | C | C | C | | | | | | | | | C | C | |
| <p>Legend:</p> <p><input type="checkbox"/> C Ramp may be closed completely</p> <p><input type="checkbox"/> No work permitted</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>REMARKS:</p> <p>This chart not to be used in conjunction with Chart 15.</p> <p>1. When an Off-Ramp is allowed to be closed, place a PCMS (Portable Changeable Message Sign) in the direction of travel allowing the traffic the option to use the preceding Off-Ramp and warning them of the ramp closure ahead.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| <p align="center">Chart No. 12
 Complete Ramp Closure Hours/Ramp Lane Requirements</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|------------------------|---|---|---|---|---|---|---|---|---|----------------------------------------------------|--|--|--|--|--|--|--|--|--|--|---|---|---|
| County: SD | | | | | Route/Direction: 15/SB | | | | | | | | | | KP: M21.975 PM: M13.654
KP: M21.087 PM: M13.102 | | | | | | | | | | | | | |
| Closure Limits: SB Off-ramp to Miramar Way
SB On-ramp from Miramar Way | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 through Thursdays | | | | | C | C | C | C | C | | | | | | | | | | | | | | | | | C | C | C |
| Fridays | | | | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | | | | | C | C | C | C | C | C | C | C | | | | | | | | | | | | | |
| Sundays | | | | | | | | C | C | C | C | C | C | C | C | | | | | | | | | | | C | C | C |
| <p>Legend:</p> <p><input type="checkbox"/> C Ramp may be closed completely</p> <p><input type="checkbox"/> No work permitted</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>REMARKS:</p> <p>This chart not to be used in conjunction with Charts 4, 8, 16, 17, 19.</p> <p>1. When an Off-Ramp is allowed to be closed, place a PCMS (Portable Changeable Message Sign) in the direction of travel allowing the traffic the option to use the preceding Off-Ramp and warning them of the ramp closure ahead.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

**Chart No. 15
Complete Ramp Closure Hours/Ramp Lane Requirements**

| | | | |
|------------|------------------------|-------------------------------------------|-------------------------------------------|
| County: SD | Route/Direction: 15/SB | KP: M22.762
KP: M21.975
KP: M21.087 | PM: M14.144
PM: M13.655
PM: M13.103 |
|------------|------------------------|-------------------------------------------|-------------------------------------------|

Closure Limits: SB On-ramp from EB Miramar Rd
SB Off-ramp to Miramar Way
SB On-ramp from EB/WB Miramar Way

| 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 through Thursdays | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | | |
| Fridays | | | | | | | | | | | | | | | | | | | | | | | | C | C | C |
| Saturdays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | |
| Sundays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | |

Legend:

C Ramp may be closed completely

No work permitted

REMARKS:

This chart not to be used in conjunction with Charts 4, 5, 6, 8, 9, 11, 14, 16, 17, 19.

This chart to be used for two (2) weekends only for each ramp.

These 3 ramps may not be closed simultaneously.

1. Detour EB Miramar Rd On-ramp to SB 15

Detour EB Miramar Rd On-ramp to SB 15 traffic via easterly on Miramar Rd to NB 15 thence northerly on Rte 15 to NB 15 Off-ramp to Carroll Canyon Rd thence westerly on Carroll Canyon Rd to SB 15.

When this ramp is closed, place a PCMS (Portable Changeable Message Sign) on EB Miramar Rd W. of Kearny Villa Rd. warning the traffic of the closure ahead.

2. Detour SB 15 Off-ramp to Miramar Way

Detour SB 15 Off-ramp to Miramar Way traffic via southerly on Rte 15 to SB 163 thence southerly on Rte 163 to SB 163 Off-ramp to NB Kearny Villa Rd thence northerly on Kearny Villa Rd to Miramar Way.

When this ramp is closed, place a PCMS (Portable Changeable Message Sign) on SB 15 N. of Carroll Canyon Rd. warning the traffic of the closure ahead.

3. Detour EB Miramar Way On-ramp to SB 1

Detour EB Miramar Way On-ramp to SB 15 traffic via easterly on Miramar Way to NB 15 thence northerly on Rte 15 to NB 15 Off-ramp to Pomerado Rd/Miramar Rd thence westerly on Pomerado Rd/Miramar Rd to SB 15.

When this ramp is closed, place a PCMS (Portable Changeable Message Sign) on EB Miramar Way W. of Kearny Villa Rd. warning the traffic of the closure ahead.

4. Detour WB Miramar Way On-ramp to SB 15

Detour WB Miramar Way On-ramp to SB 15 traffic via westerly on Miramar Way to NB Kearny Villa Rd. thence northerly on Kearny Villa Rd. to EB Miramar Rd. thence easterly on Miramar Rd. to SB 15 On-ramp from EB Miramar Rd.

**Chart No. 16
Complete Freeway/Expressway Closure Hours**

| | | |
|------------|------------------------|--------------------------------------------|
| County: SD | Route/Direction: 15/SB | KP: M21.458/R17.018
PM: M13.334/R10.575 |
|------------|------------------------|--------------------------------------------|

Closure Limits: Miramar Way OC to Jct Rte 52

| 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 through Thursdays | 1 | C | C | C | C | C | 1 | | | | | | | | | | | | | | | | | 3 | 2 | 2 | |
| Fridays | 1 | C | C | C | C | C | 1 | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sundays | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 2 | 1 |

Legend:

- 1 Provide at least one through traffic lane open in direction of travel
- 2 Provide at least two adjacent through traffic lanes open in direction of travel
- 3 Provide at least three adjacent through traffic lanes open in direction of travel
- C Freeway or expressway may be closed completely.
- No complete freeway or expressway closure is permitted.

REMARKS:

This chart not to be used in conjunction with Charts 12, 15.

This chart may be used for overhead signs only.

1. Detour SB 15 for the full Freeway closure
Detour SB 15 traffic via SB 15 Off-ramp to WB Miramar Way thence westerly on Miramar Way to SB Kearny Villa Rd thence southerly on Kearny Villa Rd to SB 163 thence southerly on Rte 163 to SB 163 Connector WB 52 thence westerly on Rte 52 to Convoy St thence southerly on Convoy St to EB 52 thence easterly on Rte 52 to Connector SB 15.

When the freeway is closed, place a PCMS (Portable Changeable Message Sign) on SB 15 N. of Miramar Rd/Pomerado Rd. warning the traffic of the closure ahead.

**Chart No. 17
Complete Freeway/Expressway Closure Hours**

| | | |
|------------|------------------------|----------------------------------------------|
| County: SD | Route/Direction: 15/SB | KP: M23.359/ M21.458
PM: M14.515/ M13.334 |
|------------|------------------------|----------------------------------------------|

Closure Limits: 0.4 km N. of Miramar Rd OC to Miramar Way OC

| 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 through Thursdays | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | 3 | 2 | 2 | |
| Fridays | | C | C | C | C | C | | | | | | | | | | | | | | | | | | | | | | |
| Saturdays | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sundays | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 2 | 1 |

Legend:

- 1 Provide at least one through traffic lane open in direction of travel
- 2 Provide at least two adjacent through traffic lanes open in direction of travel
- 3 Provide at least three adjacent through traffic lanes open in direction of travel
- C Freeway or expressway may be closed completely.
- No complete freeway or expressway closure is permitted.

REMARKS:

This chart not to be used in conjunction with Charts 12, 13, 15.

This chart may be used for overhead signs only.

1. Primary Detour: Detour SB 15 for the full Freeway closure
Detour SB 15 traffic via SB 15 Off-ramp to WB Miramar Rd thence westerly on Miramar Rd to SB Kearny Villa Rd thence southerly on Kearny Villa Rd to EB Miramar Way thence easterly on Miramar Way to SB Rte. 15.
2. Secondary Detour: Detour SB RTE 15 for the full Freeway closure
Detour SB RTE 15 traffic via SB RTE 15 Off-ramp to Carroll Canyon Rd thence westerly on Carroll Canyon Rd to SB Kearny Villa Rd thence southerly on Kearny Villa Rd to EB Miramar Way thence easterly on Miramar Way to SB Rte. 15.

When the freeway is closed, place a PCMS (Portable Changeable Message Sign) on SB Rte. 15 N. of Carroll Canyon Rd. warning the traffic of the closure ahead.

Chart No. 20
Complete Ramp Closure Hours/Ramp Lane Requirements

| | | |
|------------|------------------------|-------------|
| County: SD | Route/Direction: 15/NB | PM: M14.429 |
|------------|------------------------|-------------|

Closure Limits: NB On from WB Pomerado Rd.

| 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 through Thursdays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Fridays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Saturdays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| Sundays | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |

Legend:

C Ramp may be closed completely

Work permitted within project right of way where shoulder or lane closure is not required.

REMARKS:

This chart not to be used in conjunction with Charts 5, 12, 14, 15.

This chart to be used for one time only for ten (10) days.

1. Detour WB Pomerado Rd to NB Rte 15
 Detour WB Pomerado Rd to NB Rte 15 traffic via westerly on Pomerado Rd to WB Miramar Rd thence westerly on Miramar Rd to NB Kearny Villa Rd thence northerly on Kearny Villa Rd to EB Carroll Canyon Rd thence easterly on Carroll Canyon Rd to NB 15.

When the ramp is closed, Place a PCMS (Portable Changeable Message Sign) on WB Pomerado Rd east of Scripps Ranch Blvd, warning traffic of the NB RTE 15 On-ramp closure/detour ahead.

**Chart No. 21
HOV Lane Requirements**

| | | |
|------------|-----------------------------------------------------|----------------------------------------|
| County: SD | Route/Direction: NB/SB 15
"Reversible HOV Lanes" | KP: 19.13 – 30.39
PM: 11.89 – 18.89 |
|------------|-----------------------------------------------------|----------------------------------------|

Closure Limits: Jct. Rte 15/163 to 1.13 Km. (.7 Mi.) North of Poway Rd. OC

| 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 | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| Tuesday through Thursdays | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fridays | | | | | | | | | | | | | | | | | | | | | | X | X | X | X |
| Saturday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sunday | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

Legend:

HOV lanes may be closed.

No HOV lane closure allowed.

REMARKS:

- This chart not to be used in conjunction with Chart 22.
- This chart may be used 5 time(s) only.
- This chart shall be used with coordination from the TMC, Phone No.: 858-467-3090.
- 1. Each request for any closure on the HOV Lanes MUST be submitted to the District Traffic Manager for approval.
- 2. Each request for use of the HOV Lanes MUST be submitted to the Transportation Management Center (TMC) 2-weeks in advance for approval. This will expedite scheduling of TMC personnel for weekend work. If the work is cancelled for any reason, the TMC MUST be notified as soon as possible.
- 3. The Contractor and any Caltrans person responsible for overseeing the work/contract is responsible for maintaining safety on the HOV Lanes during the scheduled work. Caltrans Maintenance units and/or CHP units may be on the lanes when the lanes are not open to the motoring public.
- 4. The HOV Lanes are used as an alternate route when a major incident occurs on the main lanes of I-15 within the 8-mile length of the HOV Lanes. All contractor and Caltrans personnel, vehicles, and equipment must be able to vacate the HOV Lanes within approximately 20 minutes of being notified by the TMC.
- 5. It is imperative the responsible Caltrans person and/or contractor have cellular phones so the TMC has contact with them at all times while they are on the lanes.
- 6. A list of contractor personnel, along with the responsible Caltrans personnel, MUST be on file in the TMC including pager and cellular phone number information prior to approval for use of the HOV lanes for the work.
- 7. It is the responsibility of the contractor to post closure information signs 3 days in advance of a full weekend closure occurring during normal operational hours. When closing the HOV lanes completely (all lanes), all entrance gates on the HOV Lanes (Gate 1, Gate 2, Gate 5) will be closed prior to the beginning of work. It is the responsibility of the contractor and/or Caltrans personnel on the HOV lanes to assist the TMC in this procedure. Once this is done, the work may proceed.
- 8. After completing work for the night and prior to leaving the I-15 HOV Express Lanes, all HOV Gates MUST be re-opened. Contact TMC personnel by phone (858-467-3090 or 3089) to complete this procedure.
- 9. New operational hours have been implemented for the HOV Lanes. The HOV Lanes remain open from 0500 Friday to 2000 Monday. This chart allows the closing of the HOV Lanes during specific time frames for construction work.

**Chart No. 22
HOV Lane Requirements**

| | | |
|------------|-----------------------------------------------------|----------------------------------------|
| County: SD | Route/Direction: NB/SB 15
"Reversible HOV Lanes" | KP: 19.13 – 30.39
PM: 11.89 – 18.89 |
|------------|-----------------------------------------------------|----------------------------------------|

Closure Limits: Jct. Rte 15/163 to 1.13 Km. (.7 Mi.) North of Poway Rd. OC

| 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 | X | X | X | X | | | | | | | | | | | | | | | | | | X | X | X | X |
| Tuesday through Thursdays | X | X | X | X | X | | | | | | | | | | | | | | | | | X | X | X | X |
| Fridays | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | |
| Saturday | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sunday | | | | | | | | | | | | | | | | | | | | | | X | X | X | X |

Legend:

HOV lanes may be closed.

No HOV lane closure allowed.

REMARKS:

This chart not to be used in conjunction with Chart 21.

This chart shall be used with coordination from the TMC, Phone No.: 858-467-3090.

1. Each request for any closure on the HOV Lanes MUST be submitted to the District Traffic Manager for approval.
2. Each request for use of the HOV Lanes MUST be submitted to the Transportation Management Center (TMC) 2-weeks in advance for approval. This will expedite scheduling of TMC personnel for weekend work. If the work is cancelled for any reason, the TMC MUST be notified as soon as possible.
3. The Contractor and any Caltrans person responsible for overseeing the work/contract is responsible for maintaining safety on the HOV Lanes during the scheduled work. Caltrans Maintenance units and/or CHP units may be on the lanes when the lanes are not open to the motoring public.
4. The HOV Lanes are used as an alternate route when a major incident occurs on the main lanes of I-15 within the 8-mile length of the HOV Lanes. All contractor and Caltrans personnel, vehicles, and equipment must be able to vacate the HOV Lanes within approximately 20 minutes of being notified by the TMC.
5. It is imperative the responsible Caltrans person and/or contractor have cellular phones so the TMC has contact with them at all times while they are on the lanes.
6. A list of contractor personnel, along with the responsible Caltrans personnel, MUST be on file in the TMC including pager and cellular phone number information prior to approval for use of the HOV lanes for the work.
7. It is the responsibility of the contractor to post closure information signs 3 days in advance of a full closure occurring during normal operational hours. When closing the HOV lanes completely (all lanes), all entrance gates on the HOV Lanes (Gate 1, Gate 2, Gate 5) will be closed prior to the beginning of work. It is the responsibility of the contractor and/or Caltrans personnel on the HOV lanes to assist the TMC in this procedure. Once this is done, the work may proceed.
8. After completing work for the night and prior to leaving the I-15 HOV Express Lanes, all HOV Gates MUST be re-opened. Contact TMC personnel by phone (858-467-3090 or 3089) to complete this procedure.

**Chart No. 23
HOV Ramp Requirements**

| | | |
|------------|-------------------------|------------------------------|
| County: SD | Route/Direction: NB 163 | KP: R 18.073
PM: R 11.233 |
|------------|-------------------------|------------------------------|

Closure Limits: NB Off-ramp to NB Reversible HOV Lanes

| 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 | R | R | R | R | | | | | | | | | | | | | | | | | | | | | R | R | R | R | |
| Tuesday through Thursdays | R | R | R | R | R | | | | | | | | | | | | | | | | | | | | | R | R | R | R |
| Fridays | R | R | R | R | R | | | | | | | | | | | | | | | | | | | | | | | | |
| Saturday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sunday | | | | | | | | | | | | | | | | | | | | | | | | | | R | R | R | R |

Legend:

R HOV ramp may be closed.

No HOV lane closure allowed.

REMARKS:

This chart not to be used in conjunction with Chart 21.

This chart shall be used with coordination from the TMC, Phone No.: 858-467-3090.

1. Each request for any closure on the HOV Lanes MUST be submitted to the District Traffic Manager for approval.
2. Each request for use of the HOV Lanes MUST be submitted to the Transportation Management Center (TMC) 2-weeks in advance for approval. This will expedite scheduling of TMC personnel for weekend work. If the work is cancelled for any reason, the TMC MUST be notified as soon as possible.
3. The Contractor and any Caltrans person responsible for overseeing the work/contract is responsible for maintaining safety on the HOV Lanes during the scheduled work. Caltrans Maintenance units and/or CHP units may be on the lanes when the lanes are not open to the motoring public.
4. The HOV Lanes are used as an alternate route when a major incident occurs on the main lanes of I-15 within the 8-mile length of the HOV Lanes. All contractor and Caltrans personnel, vehicles, and equipment must be able to vacate the HOV Lanes within approximately 20 minutes of being notified by the TMC.
5. It is imperative the responsible Caltrans person and/or contractor have cellular phones so the TMC has contact with them at all times while they are on the lanes.
6. A list of contractor personnel, along with the responsible Caltrans personnel, MUST be on file in the TMC including pager and cellular phone number information prior to approval for use of the HOV lanes for the work.
7. It is the responsibility of the contractor to post closure information signs 3 days in advance of any HOV closure occurring during normal operational hours. When closing the HOV lanes completely (all lanes), all entrance gates on the HOV Lanes (Gate 1, Gate 2, Gate 5) will be closed prior to the beginning of work. It is the responsibility of the contractor and/or Caltrans personnel on the HOV lanes to assist the TMC in this procedure. Once this is done, the work may proceed.
8. After completing work for the night and prior to leaving the I-15 HOV Express Lanes, all HOV Gates MUST be re-opened. Contact TMC personnel by phone (858-467-3090 or 3089) to complete this procedure.

**Chart No. 24
HOV Ramp Requirements**

| | | |
|------------|------------------------|------------------------------|
| County: SD | Route/Direction: NB 15 | KP: M 18.342
PM: M 11.410 |
|------------|------------------------|------------------------------|

Closure Limits: NB Off-ramp to NB Reversible HOV Lanes

| 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 | R | R | R | R | | | | | | | | | | | | | | | | | | R | R | R | R |
| Tuesday through Thursdays | R | R | R | R | R | | | | | | | | | | | | | | | | | R | R | R | R |
| Fridays | R | R | R | R | R | | | | | | | | | | | | | | | | | | | | |
| Saturday | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sunday | | | | | | | | | | | | | | | | | | | | | | R | R | R | R |

Legend:

R HOV ramp may be closed.

No HOV lane closure allowed.

REMARKS:

This chart not to be used in conjunction with Chart 21.

This chart shall be used with coordination from the TMC, Phone No.: 858-467-3090.

1. Each request for any closure on the HOV Lanes MUST be submitted to the District Traffic Manager for approval.
2. Each request for use of the HOV Lanes MUST be submitted to the Transportation Management Center (TMC) 2-weeks in advance for approval. This will expedite scheduling of TMC personnel for weekend work. If the work is cancelled for any reason, the TMC MUST be notified as soon as possible.
3. The Contractor and any Caltrans person responsible for overseeing the work/contract is responsible for maintaining safety on the HOV Lanes during the scheduled work. Caltrans Maintenance units and/or CHP units may be on the lanes when the lanes are not open to the motoring public.
4. The HOV Lanes are used as an alternate route when a major incident occurs on the main lanes of I-15 within the 8-mile length of the HOV Lanes. All contractor and Caltrans personnel, vehicles, and equipment must be able to vacate the HOV Lanes within approximately 20 minutes of being notified by the TMC.
5. It is imperative the responsible Caltrans person and/or contractor have cellular phones so the TMC has contact with them at all times while they are on the lanes.
6. A list of contractor personnel, along with the responsible Caltrans personnel, MUST be on file in the TMC including pager and cellular phone number information prior to approval for use of the HOV lanes for the work.
7. It is the responsibility of the contractor to post closure information signs 3 days in advance of any full closure occurring during normal operational hours. When closing the HOV lanes completely (all lanes), all entrance gates on the HOV Lanes (Gate 1, Gate 2, Gate 5) will be closed prior to the beginning of work. It is the responsibility of the contractor and/or Caltrans personnel on the HOV lanes to assist the TMC in this procedure. Once this is done, the work may proceed.
8. After completing work for the night and prior to leaving the I-15 HOV Express Lanes, all HOV Gates MUST be re-opened. Contact TMC personnel by phone (858-467-3090 or 3089) to complete this procedure.

**Chart No. 25
HOV Ramp Requirements**

| | | |
|------------|--------------------------------------------------|--------------------------|
| County: SD | Route/Direction: SB 15
"Reversible HOV Lanes" | KP: M19.40
PM: M12.06 |
|------------|--------------------------------------------------|--------------------------|

Closure Limits: SB Off-ramp to SB 163

| 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 | R | R | R | R | | | | | | | | | | | | | | | | | | R | R | R | R |
| Tuesday through Thursdays | R | R | R | R | R | | | | | | | | | | | | | | | | | R | R | R | R |
| Fridays | R | R | R | R | R | | | | | | | | | | | | | | | | | | | | |
| Saturday | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sunday | | | | | | | | | | | | | | | | | | | | | | R | R | R | R |

Legend:

R HOV ramp may be closed.

No HOV lane closure allowed.

REMARKS:

This chart not to be used in conjunction with Chart 21.

This chart shall be used with coordination from the TMC, Phone No.: 858-467-3090.

1. Each request for any closure on the HOV Lanes MUST be submitted to the District Traffic Manager for approval.
2. Each request for use of the HOV Lanes MUST be submitted to the Transportation Management Center (TMC) 2-weeks in advance for approval. This will expedite scheduling of TMC personnel for weekend work. If the work is cancelled for any reason, the TMC MUST be notified as soon as possible.
3. The Contractor and any Caltrans person responsible for overseeing the work/contract is responsible for maintaining safety on the HOV Lanes during the scheduled work. Caltrans Maintenance units and/or CHP units may be on the lanes when the lanes are not open to the motoring public.
4. The HOV Lanes are used as an alternate route when a major incident occurs on the main lanes of I-15 within the 8-mile length of the HOV Lanes. All contractor and Caltrans personnel, vehicles, and equipment must be able to vacate the HOV Lanes within approximately 20 minutes of being notified by the TMC.
5. It is imperative the responsible Caltrans person and/or contractor have cellular phones so the TMC has contact with them at all times while they are on the lanes.
6. A list of contractor personnel, along with the responsible Caltrans personnel, MUST be on file in the TMC including pager and cellular phone number information prior to approval for use of the HOV lanes for the work.
7. It is the responsibility of the contractor to post closure information signs 3 days in advance of any HOV closure occurring during normal operational hours. When closing the HOV lanes completely (all lanes), all entrance gates on the HOV Lanes (Gate 1, Gate 2, Gate 5) will be closed prior to the beginning of work. It is the responsibility of the contractor and/or Caltrans personnel on the HOV lanes to assist the TMC in this procedure. Once this is done, the work may proceed.
8. After completing work for the night and prior to leaving the I-15 HOV Express Lanes, all HOV Gates MUST be re-opened. Contact TMC personnel by phone (858-467-3090 or 3089) to complete this procedure.

**Chart No. 26
HOV Ramp Requirements**

| | | |
|------------|--------------------------------------------------|------------------------|
| County: SD | Route/Direction: SB 15
"Reversible HOV Lanes" | KP: 19.13
PM: 11.89 |
|------------|--------------------------------------------------|------------------------|

Closure Limits: SB Off-ramp to SB 15

| 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 | R | R | R | R | | | | | | | | | | | | | | | | | | R | R | R | R |
| Tuesday through Thursdays | R | R | R | R | R | | | | | | | | | | | | | | | | | R | R | R | R |
| Fridays | R | R | R | R | R | | | | | | | | | | | | | | | | | | | | |
| Saturday | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sunday | | | | | | | | | | | | | | | | | | | | | | R | R | R | R |

Legend:

R HOV ramp may be closed.

No HOV lane closure allowed.

REMARKS:

This chart not to be used in conjunction with Chart 21.

This chart shall be used with coordination from the TMC, Phone No.: 858-467-3090.

1. Each request for any closure on the HOV Lanes MUST be submitted to the District Traffic Manager for approval.
2. Each request for use of the HOV Lanes MUST be submitted to the Transportation Management Center (TMC) 2-weeks in advance for approval. This will expedite scheduling of TMC personnel for weekend work. If the work is cancelled for any reason, the TMC MUST be notified as soon as possible.
3. The Contractor and any Caltrans person responsible for overseeing the work/contract is responsible for maintaining safety on the HOV Lanes during the scheduled work. Caltrans Maintenance units and/or CHP units may be on the lanes when the lanes are not open to the motoring public.
4. The HOV Lanes are used as an alternate route when a major incident occurs on the main lanes of I-15 within the 8-mile length of the HOV Lanes. All contractor and Caltrans personnel, vehicles, and equipment must be able to vacate the HOV Lanes within approximately 20 minutes of being notified by the TMC.
5. It is imperative the responsible Caltrans person and/or contractor have cellular phones so the TMC has contact with them at all times while they are on the lanes.
6. A list of contractor personnel, along with the responsible Caltrans personnel, MUST be on file in the TMC including pager and cellular phone number information prior to approval for use of the HOV lanes for the work.
7. It is the responsibility of the contractor to post closure information signs 3 days in advance of any HOV closure occurring during normal operational hours. When closing the HOV lanes completely (all lanes), all entrance gates on the HOV Lanes (Gate 1, Gate 2, Gate 5) will be closed prior to the beginning of work. It is the responsibility of the contractor and/or Caltrans personnel on the HOV lanes to assist the TMC in this procedure. Once this is done, the work may proceed.
8. After completing work for the night and prior to leaving the I-15 HOV Express Lanes, all HOV Gates MUST be re-opened. Contact TMC personnel by phone (858-467-3090 or 3089) to complete this procedure.

Erection and removal of falsework at locations where falsework openings are required shall be undertaken one location at a time. During falsework erection and removal, public traffic in the lanes over which falsework is being erected or removed shall be detoured or stopped as specified in this section, "Maintaining Traffic." Falsework erection shall include adjustments or removal of components that contribute to the horizontal stability of the falsework system. Falsework removal shall include lowering falsework, blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

The Contractor shall have necessary materials and equipment on the site to erect or remove the falsework in any one span or over any one opening before detouring or stopping public traffic.

10-1.24 CLOSURE REQUIREMENTS AND CONDITIONS

Closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Sunday noon through the following Sunday noon. Closures involving work (temporary barrier placement and paving operations) that will reduce horizontal clearances, traveled way inclusive of shoulders, to 2 lanes or less shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation. Closures involving work (pavement overlay, overhead sign installation, falsework and girder erection) that will reduce the vertical clearances available to the public, shall be submitted not less than 25 days and not more than 125 days before the anticipated start of operation.

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.

For each 10-minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct \$11,750 per interval from moneys due or that may become due the Contractor under the contract.

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.

10-1.25 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes and ramps 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 and ramp 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.

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 2.1 m 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 13 mm high and located on the left (street) side at the lower front corner. Each TMA shall have the manufacturer's recommendation for mounting height above the ground marked in minimum 25 mm tall characters at conspicuous locations on the TMA. 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.

10-1.26 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. On multilane roadways (freeways and expressways) edgeline 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 7.3 m. 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 7.3 m 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 paint a solid 100-mm 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 30 m.
2. Temporary pavement delineation for left edgelines shall, at the option of the Contractor, consist of either paint solid 100-mm 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 30 m or temporary pavement markers placed at longitudinal intervals of not more than 1.8 m.

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.

Channelizers used for temporary edgeline delineation shall be the surface mounted type and shall be orange in color. Channelizer bases shall be cemented to the pavement in the same manner provided for cementing pavement markers to pavement in "Pavement Markers" of these special provisions, except epoxy adhesive shall not be used to place channelizers on the top layer of pavement. Channelizers shall be, at the Contractor's option, one of the surface mount types (900 mm) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary edgeline delineation shall be removed when no longer required for the direction of public traffic as determined by the Engineer.

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 be required.

Temporary painted traffic stripe shall conform to the provisions in "Paint Traffic Stripe and Pavement Marking" of these special provisions, 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 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 asphalt concrete 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 shown on the plans will be measured and paid for in the same manner specified for paint traffic stripe 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 temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and centerline delineation) 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.

Attention is directed to "Remove Pavement Marker", except for pavement markers not shown on the plans, of these special provisions for payment.

Removal of temporary traffic stripe shall conform to Section 15, "Existing Highway Facilities," of the Standard Specifications.

10-1.27 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.

At the time of completion of the project, certain barricades shall be left in place as directed by the Engineer. In addition to the contract unit price or prices paid for the type or types of barricades, the cost of leaving the barricades in place will be paid for at the contract unit price for barricade (left in place).

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.

10-1.28 PORTABLE CHANGEABLE MESSAGE SIGN

Portable changeable message signs shall be furnished, placed, operated, and maintained at locations shown on the plans or where designated by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions. Messages displayed on the portable changeable message signs shall be as specified on the plans and shall conform to Section 12-3.12 "Portable Changeable Message Signs," of the Standard Specifications and "Maintaining Traffic" of these special provisions."

The Contractor shall have 15 portable changeable message signs on the project at all times.

A portable changeable message sign shall be placed in advance of the first warning sign for each stationary lane closure.

A portable changeable message sign shall be placed before and during ramp and connector closures.

A portable changeable message sign shall be placed during speed zone reductions. When used in conjunction with a lane closure, use one portable changeable message sign, with both the speed zone reduction and the lane closure messages.

10-1.29 TEMPORARY RAILING

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Attention is directed to "Public Safety" and "Order of Work" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

10-1.30 TRAFFIC PLASTIC DRUM

GENERAL

Summary

The Contractor may use traffic plastic drums instead of portable delineators, tubular markers, cones, and Type I and Type II barricades.

At the completion of the project, traffic plastic drums, except as shown on the plans and as directed by the Engineer to be left in place, shall become the property of the Contractor and removed from the site of the work.

At the time of completion of the project, certain traffic plastic drums shall be left in place as shown on the plans and as directed by the Engineer. In addition to the contract unit price paid for the traffic plastic drums, the cost of leaving the traffic plastic drums in place will be paid for at the contract unit price for traffic plastic drums (left in place).

Traffic plastic drums shall be installed as shown on the plans when temporary railing (Type K) is placed as required by "Public Safety" of these special provisions.

Comply with Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications.

Comply with Section 6F.62, "Drums," of the California Manual On Uniform Traffic Control Devices.

Comply with a traffic plastic drum manufacturer's recommendations for weight and ballast.

Definitions

Orange-colored: Orange-colored may be either orange, red-orange, fluorescent orange or fluorescent red-orange in color.

Quality Assurance

A white and an orange-colored retroreflective stripe must be a brand of retroreflective sheeting listed on the Department's "Prequalified and Tested Signing and Delineation Materials," elsewhere in these special provisions. A white and an orange-colored stripe may be either Type III, Type IV, Type VI, Type VII, Type VIII, or Type IX retroreflective sheeting. Use the same type and brand of retroreflective sheeting for a white and an orange-colored retroreflective stripe on all traffic plastic drums.

Submit a Certificate of Compliance for Traffic Plastic Drums to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

MATERIALS

Drum

Each traffic plastic drum must:

1. Be composed of an orange-colored low-density polyethylene.
2. Be flexible and collapsible upon vehicle impact.
3. Have a weighted-base to maintain an upright position and prevent displacement under passing traffic.

Weighted-Base

Each weighted-base must:

1. Be detachable.
2. Be shaped to prevent rolling upon impact.
3. Be 38 inches (970 mm) maximum outside diameter.
4. Be 4 inches (100 mm) maximum height above the ground surface.

CONSTRUCTION

Use a traffic plastic drum on only one side of the traveled way. Place traffic plastic drums in a straight line on a tangent alignment and in a true arc on a curved alignment.

Use only one type of traffic plastic drum on the job site. Do not intermix traffic plastic drums, portable delineators, tubular markers, cones, and Type I and Type II barricades on the same alignment.

Do not use sandbags or comparable ballast.

A traffic plastic drum must be a minimum of 36 inches (900 mm) in height above the traveled way.

Immediately restore a displaced traffic plastic drum to its original location and upright position regardless of cause.

Remove from the job site and take possession of a traffic plastic drum upon completion of work.

MEASUREMENT AND PAYMENT

A traffic plastic drum is measured as a unit from actual count of the number of traffic plastic drums shown on the plans or ordered by the Engineer. After initial placement of traffic plastic drums, and if ordered by the Engineer, the traffic plastic drums must be moved from location to location and the cost thereof will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Traffic plastic drums that are used as part of traffic control system in place of cones, delineators, or barricades; that are used in accordance with the requirements of "Public Safety" elsewhere in these special provisions; or that are placed in excess of the number specified or shown will not be included in the count of traffic plastic drums to be paid for.

The contract unit price paid per unit for traffic plastic drum includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing and maintaining traffic plastic drums, 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 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.

Attention is directed to "Public Safety", and "Order of Work" of these special provisions.

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 4.6 m 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.

At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or TrafFix Sand Barrels manufactured after March 31, 1997, or equal:

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 Pintero, 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

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 kilograms 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 shall be placed on movable pallets or frames conforming to the 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 3.6 m 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 the provisions in "Public Safety" of these special provisions 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, except for those to be left in place, 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.

At the time of completion of the project, certain temporary crash cushion modules shall be left in place as shown on the plans and as directed by the Engineer. In addition to the contract unit price paid for the temporary crash cushions modules, the cost of leaving the crash cushion modules in place will be paid for at the contract unit price for crash cushion module (left in place).

10-1.32 TEMPORARY CRASH CUSHION (ABSORB 350)

Temporary crash cushion (ABSORB 350) shall be furnished and installed as shown on the plans and in conformance with the manufacturer's instructions and these special provisions.

Reflectors on the temporary crash cushion (ABSORB 350) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary crash cushion (ABSORB 350) shall be a water-filled, non-redirective, gating crash cushion, manufactured by Barrier Systems, Inc. Temporary crash cushion (ABSORB 350) shall conform to the descriptions as follows:

| Contract Item Description | Manufacturer's Product Description |
|--------------------------------------|--------------------------------------------------|
| Temporary Crash Cushion (ABSORB 350) | ABSORB 350 TL-3 (9 element system) Crash Cushion |

The successful bidder can obtain the temporary crash cushion from the following source:

- A. Manufacturer:
 BARRIER SYSTEMS, Inc.,
 180 River Road,
 Rio Vista, CA 94571,
 Telephone 888-800-3691

B. Distributors:
Statewide Safety & Signs, Inc.
13765 Biasedell Place
Poway, CA 92064
Telephone 858-679-7292

The price quoted by the distributor for the temporary crash cushion (ABSORB 350) is \$7,470.00, not including sales tax. The above price will be firm for orders placed on or before April 30, 2008, provided delivery is accepted within 90 days after the order is placed.

Temporary crash cushion (ABSORB 350) shall be installed in conformance with the manufacturer's recommendations.

The Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list for each model installed.

Temporary crash cushions (ABSORB 350) damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Temporary crash cushions (ABSORB 350) 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.

A Type R or P marker panel shall be attached to the front of the temporary crash cushion (ABSORB 350), when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the temporary crash cushion (ABSORB 350) with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion (ABSORB 350) and marker panels shall become the property of the Contractor and shall be removed from the site of the work. The temporary crash cushion (ABSORB 350) shall not be installed in the permanent work.

Temporary crash cushion (ABSORB 350) will be measured by the unit as determined from the actual count of cushions used in the work or ordered by the Engineer at each location.

Repairing the temporary crash cushion (ABSORB 350) 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 (ABSORB 350).

If the Engineer orders a lateral move of the temporary crash cushion (ABSORB 350) and the repositioning is not shown on the plans, moving the temporary crash cushion (ABSORB 350) will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and the temporary crash cushion (ABSORB 350) will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion (ABSORB 350) shall include full compensation for furnishing all labor, materials (including bolts, nuts, washers, hinges, tie wraps, caps, marker panels, barrier transition assemblies, end assemblies, and water), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing and removing temporary crash cushion (ABSORB 350), 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 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.

Attention is directed to Section 7-1.06, "Safety and Health Provisions," of the Standard Specifications. Work practices and worker health and safety shall conform to the California Division of Occupational Safety and Health Construction Safety Orders Title 8, of the California Code of Regulations including Section 5158, "Other Confined Space Operations."

Existing footing concrete that is below ground and outside of the footing limits shown on the contract plans or original contract plans shall be removed as directed by the Engineer and will be paid for in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

ABANDON CULVERT

Existing culverts, where shown on the plans to be abandoned, shall be abandoned in place or, at the option of the Contractor, the culverts shall be removed and disposed of. Resulting openings into existing structures that are to remain in place shall be plugged with concrete conforming to the provisions in Section 90-10 "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 300 kg of cementitious material per cubic meter.

Abandoning culverts in place shall conform to the following:

1. Culverts that intersect the side slopes shall be removed to a depth of not less than one meter measured normal to the plane of the finished side slope, before being abandoned.

2. Culverts 300 mm in diameter and larger, shall, at the Contractor's option, be backfilled with either sand, controlled low strength material or slurry cement backfill conforming to the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications by any method acceptable to the Engineer that completely fills the pipe. Sand backfill material shall be clean, free draining, and free from roots and other deleterious substances.
3. The ends of culverts shall be securely closed by a 150 mm thick tight fitting plug or wall of commercial quality concrete.

Culverts shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended culvert abandonment.

If the Contractor elects to remove and dispose of a culvert which is specified to be abandoned, as provided herein, backfill specified for the pipe will be measured and paid for in the same manner as if the culvert has been abandoned in place.

Backfill will be measured by the cubic meter determined from the dimensions of the culverts to be abandoned.

The contract price paid per cubic meter for sand backfill shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in backfilling culverts with sand, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Controlled low strength material and slurry cement backfill, if used at the Contractor's option, will be measured and paid for by the cubic meter as sand backfill.

Full compensation for concrete plugs, pipe removal, structure excavation, and backfill shall be considered as included in the contract price paid per meter for abandon culvert and no additional compensation will be allowed therefor.

ABANDON IRRIGATION CROSSOVER

Existing irrigation crossovers, where shown on the plans to be abandoned, shall be abandoned in place.

Abandoning irrigation crossovers shall conform to the following:

1. Existing No. 5 pull box, Type A pavement marker, waterline, electrical conduit and control and neutral conductor wires shall be removed 0.6 meters below finished grade and disposed of. The top of the waterline and electrical conduit that remain in place, shall be capped. Resulting holes shall be backfilled on the same day in which the pull box is removed.

Irrigation crossovers shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended irrigation crossover abandonment.

Full compensation for removing and disposing of pull box, Type A pavement marker, electrical conduit, waterline (including capping conduit and waterline) and control and neutral conductor wires, excavation, and backfill shall be considered as included in the contract unit price paid for abandon irrigation crossover and no additional compensation will be allowed therefor.

ABANDON INLET

Existing pipe inlets and concrete drainage inlets, where shown on the plans to be abandoned shall be abandoned.

The top portion of the inlets shall be removed to a depth of 0.3 m below finished grade.

Grates shall be removed and reused in the work as shown on the plans.

Full compensation for removing and reusing grates shall be considered as included in the contract price paid for the item of work requiring reuse of the grate.

REMOVE RAILING AND BARRIER

Existing metal beam guard railing and double thrie beam barrier, where shown on the plans to be removed, shall be removed and disposed of.

Existing concrete anchors or steel foundation tubes shall be completely removed and disposed of. Full compensation for removing concrete anchors shall be considered as included in the contract price paid per meter for remove metal beam guard railing and remove double thrie beam barrier and no separate payment will be made therefor.

Full compensation for removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes shall be considered as included in the contract price paid per meter for remove metal beam guard railing and remove double thrie beam barrier and no separate payment will be made therefor.

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.

Bridge mounted sign structure removal shall consist of removing sign panels and frames, sign lighting electrical equipment, walkways with safety railings, structural braces and supports, and hardware.

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 1 m 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, and temporary pavement markers, including underlying adhesive, shown on the stage construction and traffic handling sheets of the plans when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

Full compensation for removing and disposing of pavement markers and underlying adhesive, including temporary pavement markers and underlying adhesive shown on the stage construction and traffic handling sheets of the plans, shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and no separate payment will be made therefor.

REMOVE CHAIN LINK FENCE

Existing chain link fence, including post footings and anchor blocks, where shown on the plans to be removed, shall be removed and disposed of.

REMOVE ASPHALT CONCRETE DIKE

Existing asphalt concrete dike, where shown on the plans to be removed, shall be removed.

Prior to removing the dike, the outside edge of the asphalt concrete to remain in place shall be cut on a neat line to a minimum depth of 50 mm.

At the Contractor's option, dikes may be removed by the cold plane method. When the cold plane method is selected, saw cutting the outside edge to a neat line will not be required.

The dike shall be removed in such a manner that the surfacing which is to remain in place is not damaged.

The dike may be buried in embankments in the same manner provided for burying concrete in embankments in Section 15-3, "Removing Concrete," of the Standard Specifications.

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.

REMOVE DELINEATOR

Existing delineators, at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing delineators shall not be removed until the existing delineators 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.

RELOCATE ROADSIDE SIGN

Existing roadside signs shall be removed and relocated to the new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

ADJUST FRAME AND COVER TO GRADE

Frames and covers of existing manholes, junction structures or other facilities shall be adjusted to grade in conformance with the provisions in Section 15-2.05, "Reconstruction," of the Standard Specifications.

COLD PLANE ASPHALT CONCRETE PAVEMENT

Existing asphalt concrete pavement shall be cold planed at the locations and to the dimensions shown on the plans.

The Contractor shall schedule paving operations so that cold planed areas are paved with asphalt concrete within the same work shift.

Planing asphalt concrete pavement shall be performed by the cold planing method. Planing of the asphalt concrete pavement shall not be done by the heater planing method.

Cold planing machines shall be equipped with a cutter head not less than 750 mm in width and shall be operated so that no fumes or smoke will be produced. The cold planing machine shall plane the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width, and shape of the cut shall be as shown on the typical cross sections or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the typical cross sections. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place.

Planed widths of pavement shall be continuous except for intersections at cross streets where the planing shall be carried around the corners and through the conform lines.

The material planed from the roadway surface, including material deposited in existing gutters or on the adjacent traveled way, 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. Removal operations of cold planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

Cold plane asphalt concrete pavement will be measured by the square meter. The quantity to be paid for will be the actual area of surface cold planed irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for cold plane asphalt concrete pavement shall include 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, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

CAP INLET AND RISER

Existing pipe inlets, risers, and concrete drainage inlets, where shown on the plans to be capped, shall be capped and the bottoms of the inlets shall be rounded with portland cement concrete as shown on the plans.

Concrete shall be minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 350 kg of cementitious material per cubic meter.

Inlets and risers shall be removed to a depth of at least 0.3-m below the grading plane.

Concrete removal shall be performed without damage to portions of the inlet that are to remain in place. Damage to existing concrete, which is to remain in place, shall be repaired by the Contractor to a condition equal to that existing prior to the beginning of removal operations. The repair of existing concrete damaged by the Contractor's operations shall be at the Contractor's expense.

Existing reinforcement that is to be incorporated in the new work shall be protected from damage and shall be thoroughly cleaned of adhering material before being embedded in the new concrete.

The quantity of capping inlets and risers will be determined as units from actual count.

The contract unit prices paid for cap inlet and cap riser shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in capping inlets and risers, including removing portions of inlets, rounding bottoms of inlets, bar reinforcing steel, and structure excavation and structure backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

REMOVE CRASH CUSHION (TYPE GREAT)

Remove crash cushion where shown on the plans to be removed shall be removed and disposed of.

Existing crash cushions shall not be removed until the existing crash cushions are no longer required unless otherwise directed by the Engineer.

Remove crash cushion will be measured and paid for by the unit.

The contract unit price paid for remove crash cushion (Type GREAT) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing crash cushion (Type GREAT), complete in place, including excavation, backfill, and disposal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

REMOVE CRASH CUSHION (SAND FILLED, MODULE)

Remove crash cushion where shown on the plans to be removed shall be removed and disposed of.

Existing crash cushions shall not be removed until the existing crash cushions are no longer required unless otherwise directed by the Engineer.

Removed crash cushion if not damaged may be constructed in the permanent work provided the materials conform to the requirements specified for the permanent work.

Remove crash cushion will be measured and paid for by the module.

The contract unit price paid for remove crash cushion (sand filled, module) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing crash cushion (sand filled, module), complete in place, including excavation, backfill, and disposal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

RELOCATE HOV POP-UP CONTROL SYSTEM

The work to be done consists of relocating airlines, pull boxes and solenoids as shown on the plans, Standard Specifications, these special provisions and as directed by the Engineer.

SUBMITTALS

Working drawings, material lists, descriptive data, samples and other submittals specified in these special provisions 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. Submittals shall be delivered to the Engineer.

Unless otherwise permitted in writing by the Engineer, all submittals required by these special provisions shall be submitted within 35 days after 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.

Whenever the specifications permit the substitution of a similar or equivalent material or article, no test or action relating to the approval of such substituted 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 35 days after the date the contract has been approved and 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, samples, 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. If the Engineer fails to complete the review within the time allowed and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay, the Contractor will be compensated for resulting losses, as provided for in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications.

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 be not larger than 559 mm x 914 mm.

The material list shall be complete as to name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols used on the plans and in the special provisions for each unit.

Parts lists and service instructions packaged with or accompanying the equipment installed in the work shall be delivered to the Engineer at the jobsite. Required operating and maintenance instructions shall be submitted in triplicate.

Manufacturer's warranties for products installed in the work shall be delivered to the Engineer at the jobsite.

Unapproved samples and samples not incorporated in the work shall be removed from State property, when directed by the Engineer.

QUALITY ASSURANCE

Pipe, fittings and valves shall be installed in accordance with the requirements in the California Plumbing Code (2001 Edition), the manufacturer's recommendations and the requirements specified herein.

Tubing

Tubing shall be 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.

Unions (for copper or brass pipe) shall be 1040 kPa cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 860 kPa cast brass, ground joint, brass to brass seat with threaded ends.

Pressure gages (for PRV)

Pressure gages (for PRV) shall have 0 to 700 kPa scale with 80 mm minimum diameter dial. Gages shall be installed within 150 mm of the inlet and outlet sides of the pressure reducing valve. Pressure gages shall be provided with a brass gage cock.

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.

INSTALLATION

Pipe and Fittings

Pipe and fittings shall be installed in accordance with the following designated uses:

| Designated Use | Pipe and Fitting Class |
|----------------|------------------------|
|----------------|------------------------|

Installing Piping

Piping installed underground shall be tested as specified in these special provisions before backfilling.

Underground copper pipe shall have brazed joints.

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.

Cutting pipe

All 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.

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.

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.

INSTALLATION OF VALVES

Pressure reducing valve

A capped tee connection and strainer shall be installed ahead of the pressure reducing valve.

Exterior valves

Exterior valves located underground shall be installed in a valve box. Extensions shall be provided as required.

Flushing completed systems

All completed systems shall be flushed and blown out.

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.

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 | | |
|---------------|---------|-----|
| Air | 860 kPa | Air |

MEASUREMENT AND PAYMENT

The contract lump sum price paid for relocate HOV pop-up control system work shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in relocate HOV pop-up control system, 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, which are necessary to relocate the HOV pop-up control system and appurtenances shall be considered as included in the contract lump sum price paid for relocate HOV pop-up control system and no additional compensation will be allowed therefor.

SALVAGE HOV TOLL BOOTH

Existing HOV toll booth, located at Station 230+52 of the Route 15 "ML" Line, shown on the plans to be salvaged, shall be salvaged.

The booth is comprised of aluminum and Plexiglas anchored to a concrete block by 12 to 16 concrete anchor bolts. The booth is 2.390 m x 4.877 m x 2.273 m in size and weighs up to 2000 kg the concrete pad is approximately 2.500 m x 5.000 m x 0.300 m with no footings.

The Contractor is to provide the FasTrak Program Manager, at SANDAG, 401 B Sttreet, San Diego, CA. 92101-4231, Telephone number (619) 699-1907 with a 90 day written notice prior to removing the booth and appurtenances. Removal of the antennas and readers located on the two gantries located at Station 230+52 of the Route 15 "ML" Line will be done by others.

Concrete foundation shall be removed and the resulting hole shall be backfilled. The backfill is to be compacted to 95 percent relative compaction.

The salvaged HOV toll booth shall be placed on a flat bed provided by SANDAG and delivered at a location directed by the Engineer.

The contract lump sum price paid for salvage HOV toll booth shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in salvaging HOV toll booth, complete in place, including removing concrete foundation and backfilling depressions, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

BRIDGE REMOVAL

Removing bridges or portions of bridges shall conform to the provisions in Section 15-4, "Bridge Removal," of the Standard Specifications and these special provisions.

Bridge removal (portion) shall consists, in general, of removing portions of structures as shown on the plans and briefly described as follows:

Location A
Pomerado Road OC (Pony Bent)
(Br. No. 57-0909)

Remove portions of Bent 3 columns and portions of footings, deck drainage system, and other removal shown on the plans.

Location B
DS ML 233 Modification

Removal of portions of existing pedestrian box culvert.

Location C
Retaining Wall ML 197R
(Br. No. 57E0045)

Removal of portions of existing slope paving.

Location D
Retaining Wall ML 219L
(Br. No. 57E0046)

Removal of portions of existing slope paving.

Location E
Retaining Wall ML 239R
(Br. No. 57E0059)

Removal of portions of existing slope paving.

Removed materials that are not to be salvaged or used in the reconstruction 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.

Bar reinforcing steel shall be removed as shown on the plans. The ends of the remaining bars shall be coated with 2 applications of a zinc-rich primer in the same manner specified for exposed ends of prestressing steel in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

Concrete surfaces shall be ground smooth where shown on the plans.

Portions of existing drain pipe shall be sealed and filled with grout as shown on the plans. Grout shall conform to the provisions for in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications.

Seals used to plug drain piping shall be grout tight and result in a smooth surface which closely matches the adjacent concrete color.

Full compensation for furnishing and applying zinc-rich primer to the ends of bar reinforcement, grinding surfaces smooth, and sealing and filling drain pipes with grout, shall be considered as included in the contract lump sum price paid for bridge removal (portion) and no additional compensation will be allowed therefor.

The Contractor shall submit a complete bridge removal plan to the Engineer for each bridge listed above, detailing procedures, sequences, and all features required to perform the removal in a safe and controlled manner.

The bridge removal plan shall include, but not be limited to the following:

- A. The removal sequence, including staging of removal operations.
- B. Equipment locations on the structure during removal operations.
- C. Temporary support shoring or temporary bracing.
- D. Locations where work is to be performed over traffic or utilities.
- E. Details, locations, and types of protective covers to be used.
- F. Measures to assure that people, property, utilities, and improvements will not be endangered.
- G. Details and measures for preventing material, equipment, and debris from falling onto public traffic.

When protective covers are required for removal of portions of a bridge, or when superstructure removal works on bridges are involved, the Contractor shall submit working drawings, with design calculations, to the Engineer for the proposed bridge removal plan, and the bridge removal plan shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California. The design calculations shall be adequate to demonstrate the stability of the structure during all stages of the removal operations. Calculations shall be provided for each stage of bridge removal and shall include dead and live load values assumed in the design of protective covers. At a minimum, a stage will be considered to be removal of the deck, the soffit, or the girders, in any span; or walls, bent caps, or columns at support locations.

The bridge removal plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The number of sets of drawings, design calculations, and the time for reviewing bridge removal plans shall be the same as specified for falsework working drawings in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications.

The following additional requirements apply to the removal of bridges or portions of bridges that are over or adjacent to roadways that may be closed to public traffic for only brief periods of time:

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- A. The closure of roadways to public traffic shall conform to the provisions in "Order of Work" and "Maintaining Traffic" of these special provisions.
- B. Prior to closing a roadway to traffic to accommodate bridge removal operations, the Contractor shall have all necessary workers, materials, and equipment at the site as needed to proceed with the removal work in an expeditious manner. While the roadway is closed to public traffic, work shall be pursued promptly and without interruption until the roadway is reopened to public traffic.
- C. Bridge removal operations shall be performed during periods of time that the roadway is closed to public traffic except as specified herein for preliminary work.
- D. Preliminary work shall be limited to operations that will not reduce the structural strength or stability of the bridge, or any element thereof, to a level that in the judgment of the Engineer would constitute a hazard to the public. This preliminary work shall also be limited to operations that cannot cause debris or any other material to fall onto the roadway. Protective covers may be used to perform preliminary work such as chipping or cutting the superstructure into segments, provided the covers are of sufficient strength to support all loads and are sufficiently tight to prevent dust and fine material from sifting down onto the traveled way. Protective covers shall extend at least 1.2 m beyond the limit of the work underway. Bottom slabs of box girders may be considered to be protective covers for preliminary work performed on the top slab inside the limits of the exterior girders.
- E. Temporary support shoring and temporary bracing shall be used in conjunction with preliminary work when necessary to insure the stability of the bridge.
- F. Temporary support shoring, temporary bracing, and protective covers shall not encroach closer than 2.4 m horizontally from the edge or 4.6 m vertically above any traffic lane or shoulder that is open to public traffic.
- G. During periods when the roadway is closed to public traffic, debris from bridge removal operations may be allowed to fall directly onto the lower roadway provided adequate protection is furnished for all highway facilities. The minimum protection for paved areas shall be a 0.6-m thick earthen pad or a 25-mm thick steel plate placed over the area where debris can fall. Prior to reopening the roadway to public traffic, all debris, protective pads, and devices shall be removed and the roadway swept clean with wet power sweepers or equivalent methods.
- H. The removal operations shall be conducted in such a manner that the portion of the structure not removed remains in a stable condition at all times.

For bridge removal that requires the Contractor's registered engineer to prepare and sign the bridge removal plan, the Contractor's registered engineer shall be present at all times when bridge removal operations are in progress. The Contractor's registered engineer shall inspect the bridge removal operation and report in writing on a daily basis the progress of the operation and the status of the remaining structure. A copy of the daily report shall be available at the site of the work at all times. Should an unplanned event occur or the bridge operation deviate from the approved bridge removal plan, the Contractor's registered engineer shall submit immediately to the Engineer for approval, the procedure of operation proposed to correct or remedy the occurrence.

ACCESS OPENING, SOFFIT

Access openings in bridge soffits shall consist of removing portions of existing box girder bridge soffits at the locations and to the dimensions shown on the plans.

A 19-mm deep saw cut shall be made around the perimeter of the soffit areas to be removed.

Bar reinforcing steel shall be removed as shown on the plans. The ends of the remaining bars shall be coated with 2 applications of a zinc-rich primer in the same manner specified for exposed ends of prestressing steel in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

Within a cell where work is to be performed, existing formwork and miscellaneous concrete that will interfere with the work shall be removed. In addition, when the work is to be done in a cell that adjoins a bent, all existing forms and sharp projections in the cell between the bent and 1.5 m past the access opening shall be removed.

All material removed shall become the property of the Contractor and shall be disposed of outside the highway right of way as provided in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

When no longer required, soffit access openings shall be closed as shown on the plans. All materials, including galvanized sheet metal covers, steel hardware, hinges, and corrosion resistant concrete expansion anchorage devices, shall be commercial quality.

Thread locking system shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

Unless specified as an option, using deck access openings in lieu of soffit access openings will not be allowed.

Access openings through soffits will be measured and paid for by the unit as access opening, soffit. Openings to be paid for will be determined from actual count of the completed units in place.

The contract unit price paid for access opening, soffit shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the soffit access opening, complete in place, including closing the soffit access opening and removing forms and miscellaneous concrete, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

REMOVE CONCRETE

Concrete, where shown on the plans to be removed, shall be removed.

Remove slope paving will be paid for on a lump sum basis.

Removing concrete curb, concrete barrier, concrete barrier (Type K), and concrete sidewalk will be measured by the meter, measured along the curb, barrier or sidewalk before removal operations.

10-1.34 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Attention is directed to "Migratory Birds" of these special provisions.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines, as shown on the plans or as specified in these special provisions and as directed by the Engineer.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed, except as shown on the plans or as specified in these special provisions to be removed, shall be protected from injury or damage resulting from the Contractor's operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

VEGETATION MOWING AND TREE REMOVAL PRIOR TO THE MIGRATORY BIRD NESTING PERIOD

All vegetation within the limits of clearing shall be mowed or cut to a minimum of 100 mm or a maximum of 200 mm from original ground. Soil and roots shall not be scraped or removed. All vegetation stems, branches, and leaves may be left in place as long as the debris does not exceed a height of 600 mm from the original grade when cutting is complete.

Vegetation may be chipped or recut after the initial cutting to achieve depth less than 600 mm.

Trees and plants within the limits of clearing shall be removed. Trees to be removed shall be verified by the Engineer prior to removal.

All trees to be removed shall be cut off not more than 0.6-m above the natural ground at any point, or completely removed. All materials shall be left in a neat and finished appearance.

Full compensation for vegetation mowing and tree removal prior to the migratory bird nesting period shall be considered as included in the contract price paid for clearing and grubbing and no additional compensation will be allowed therefor.

10-1.35 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 the source or sources of water for use on the project specified in the "Materials Information" handout available to contractors.

10-1.36 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Surplus excavated material not designated as hazardous waste due to aerially deposited lead 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 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm 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 meter 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.

Geocomposite drain for tieback retaining walls and soil nail walls shall conform to the details shown on the plans and the following requirements. In addition, if the Contractor elects to use the "Weep Hole and Geocomposite Drain" alternative where permitted on the plans, the geocomposite drain shall conform to the details shown on the plans and the following:

- A. Attention is directed to "Engineering Fabrics" under "Materials" of these special provisions.
- B. Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick nor 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.
- C. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the geocomposite drain certifying that the drain produces the required flow rate and complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates for externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.
- D. Filter fabric for the geocomposite drain shall conform to the provisions for fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.
- E. 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.
- F. 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.
- G. 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.
- H. 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.
- I. Plastic pipe shall conform to the provisions for edge drain pipe and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.
- J. Treated permeable base to be placed around the slotted plastic pipe at the bottom of the geocomposite drain shall be cement treated permeable base conforming to the provisions for cement treated permeable base in Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.
- K. The treated permeable base shall be enclosed with a high density polyethylene sheet or PVC geomembrane, not less than 250 μ m thick, which is bonded with a suitable adhesive to the concrete and geocomposite drain. Surfaces to receive the polyethylene sheet shall be cleaned before applying the adhesive. The treated permeable base shall be compacted with a vibrating shoe type compactor.

Pervious backfill material placed within the limits of payment for retaining walls will be measured and paid for as structure backfill (retaining wall).

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.

Full compensation for furnishing and installing geocomposite drain, including filter fabric, treated permeable base, and plastic pipe, shall be considered as included in the contract price paid per cubic meter for the various items of structure backfill involved and no separate payment will be made therefor.

10-1.37 TIEBACK WALL EARTHWORK

Tieback wall earthwork, consisting of excavating for tieback wall construction and backfilling around completed tieback walls, shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Attention is directed to "Tieback Anchors," of these special provisions.

Attention is directed to "Inclinometer," of these special provisions.

The Contractor shall submit to the Engineer working drawings for the proposed method of tieback wall construction for the site in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California. One set of the drawings and one copy of the design calculations shall be furnished to the Engineer.

Working drawings for tieback wall earthwork shall contain all information required for the construction and quality control of the earthwork, including the following:

- A. The proposed schedule and detailed construction sequence. Construction sequence shall include measures to ensure wall and slope stability during various stages of wall construction including provisions for discontinuous rows of nails or anchors.
- B. Methods of excavation to the staged lifts indicated and excavation equipment types.
- C. Temporary shoring plans.
- D. Drilling methods and equipment including proposed drill hole size and any variation of these along the alignments.
- E. Information on space requirements for installation equipment.
- F. A detailed construction dewatering plan addressing all elements necessary to divert, control, and dispose of surface water and ground water.
- G. Inclinometer location.

The Contractor shall allow two weeks after complete drawings and all support data are submitted for the review and approval of the proposed method of tieback wall construction.

In the event the Engineer fails to complete the review and approval within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the manner as provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Contractor shall take necessary provisions in the excavation sequence to avoid undermining of the existing bridge footing.

Excavation for walls shall be limited to that area which can be anchored and covered with shotcrete during the same work shift in which the excavation is done. Subsequent excavation shall not be made within 3 meters of previously anchored and covered portions of the wall until those anchored and covered portions are structurally complete. A portion of the wall will be considered structurally complete when the tieback anchors have been installed, the shotcrete cover has set, anchor bearing assemblies installed, and specified anchorage testing has been completed for that portion of the wall, and the test results have been furnished to the Engineer.

In addition, at Retaining Wall ML239R (Br. No. 57E0059), excavation for tiebacks shall not proceed until construction of the previous row has been completed and the tiebacks have been locked off at their design loads. The depth of excavation for a lift of tiebacks shall not extend below the bottom of the panel for that lift of tiebacks.

At Retaining Wall ML239R (Br. No. 57E0059), for the 1st and 2nd lifts of Panels 1 through 5, the following additional requirements shall apply:

- A. Tieback wall excavation shall be performed in non-adjacent slots.
- B. Slots shall be centered on the tieback and the width of the slots shall not exceed the center-to-center spacing of the tiebacks. The original ground surface shall be maintained in the unexcavated areas between the slots.
- C. After non-adjacent tiebacks are completed and locked off at the design load, additional non-adjacent slots excavation may proceed subject to the same procedures.

Excavation to the final wall alignment for the full wall height shall incorporate a working berm which shall be constructed from the top down in a staged lift sequence as shown on the approved wall earthwork working drawings. The ground level in front of the wall face shall not be excavated more than 1 meter below the level of the row of tieback anchors to be installed in that same lift.

The Contractor shall protect installed tieback anchors during excavation and subsequent operations. Any tieback anchors damaged during construction shall be replaced by the Contractor, at the Contractor's expense.

The Contractor shall remove all cobbles, boulders, rubble, or debris which are encountered at the final wall alignment during wall face excavation and which protrude from the excavated face more than 13 mm into the design shotcrete thickness as shown on the plans. Such over excavation shall be backfilled with shotcrete.

MEASUREMENT AND PAYMENT

Measurement and payment for structure excavation (tieback wall) and structure backfill (tieback wall) shall conform to the provisions in Sections 19-3.07, "Measurement," and 19-3.08, "Payment," of the Standard Specifications and these special provisions.

Full compensation for working drawings and supplements, and shoring, if required, for tieback wall construction shall be considered as included in the contract price paid per cubic meter for structure excavation (tieback wall) and no additional compensation will be allowed therefor.

Full compensation for shotcrete used to fill voids created by the removal of cobbles and boulders or other obstructions shall be considered as included in the contract price paid per cubic meter for shotcrete and no additional compensation will be allowed therefor.

10-1.38 SOIL NAIL WALL EARTHWORK

This work shall consist of stability testing, excavating for soil nail wall construction, and backfilling around completed soil nail walls in conformance with the details shown on the plans, the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications, and these special provisions.

Working Drawings

The Contractor shall submit a complete working drawing submittal for earthwork for each soil nail wall to the Offices of Structure Design in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Working drawings shall be 559 mm x 864 mm in size. For initial review, 5 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to Offices of Structure Design for final approval and use during construction.

Working drawing submittals for soil nail wall earthwork shall show the contract number, structure number, full name of the structure as shown on the project plans, and District-County-Route-Post Mile on each drawing and calculation sheet. The Contractor's name, address, and telephone and fax numbers shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner.

The working drawing submittal for soil nail wall earthwork shall contain all information required for the construction and quality control of the earthwork, including the following:

- A. A proposed schedule and detailed construction sequence. The construction sequence shall include measures to ensure wall and slope stability during all stages of wall construction, including provisions for installation of verification and proof test soil nails and discontinuous rows of soil nails.
- B. Methods of excavation to the staged lifts indicated and types of excavation equipment.
- C. Exposed vertical soil lift height and proposed maximum duration of exposure for each wall zone, including supporting calculations, and provisions for stabilization of the exposed soil face.
- D. Details for the monitoring system for wall deflection.
- E. Information on space requirements for installation equipment.
- F. A detailed construction dewatering plan addressing all elements necessary to divert, control, and dispose of surface water and ground water.

The working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California.

The Contractor shall allow the Engineer 4 weeks to review the working drawings after a complete submittal has been received.

Should the Engineer fail to review the complete working drawing submittal within the time specified 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 soil nail wall earthwork working drawing submittal, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Stability Testing

The Contractor shall perform stability testing to verify the Contractor's proposed excavation lift height and exposure duration for soil nail wall construction. Stability testing shall be performed before roadway excavation.

A minimum of one stability test shall be performed within the limits of each wall zone as defined in the following table:

Retaining Wall ML 197R

Br. No. 57E0045

| Wall Zone | Beginning Stationing | End Stationing | Upper Elevation (m) | Lower Elevation (m) |
|-----------|----------------------|----------------|---------------------|---------------------|
| 1 | 10+00 | 10+23.610 | 144.843 | 138.578 |
| 2 | 11+06.397 | 11+39.845 | 144.497 | 139.763 |

Retaining Wall ML 219L

Br. No. 57E0046

| Wall Zone | Beginning Stationing | End Stationing | Upper Elevation (m) | Lower Elevation (m) |
|-----------|----------------------|----------------|---------------------|---------------------|
| 1 | 218+77.278 | 218+88.553 | 159.461 | 153.850 |
| 2 | 219+06.353 | 219+20.248 | 159.894 | 154.120 |

The stability tests shall be conducted by performing staged roadway excavation to produce a neat excavated face no more than one meter in front of the location of the final soil nail wall face. The height of the excavated face shall be as specified in the approved working drawings. The excavated face shall be 6 meters long and parallel to the soil nail wall alignment. The excavated face shall have a constant height within the 6-meter section. Ramps may be excavated outside the 6-meter section to provide construction access. The excavated face shall be left open for the duration specified in the approved working drawings.

The excavated face shall maintain its integrity without raveling, sloughing, or measurable lateral movement at the completion of the stability test. After written approval by the Engineer, the proposed excavation height may be used in that wall zone as the stand-up height of the excavated face for the duration observed in the stability test.

If at any time the exposed excavated face fails to maintain its integrity without raveling, sloughing, or measurable lateral movement for the duration of time observed in the approved stabilization test, the Contractor shall immediately stabilize the excavated face and perform additional stability testing as described herein.

If the Contractor uses a maximum excavation lift height of not greater than 1.5 meters, no stability testing will be required.

When stability testing is not performed, shotcrete shall be applied during the same work shift in which excavation has occurred. Completion of the shotcrete facing may be delayed up to 24 hours if the Contractor demonstrates that the integrity of the excavated face is maintained.

Construction

No excavation or drilling for installation of production soil nails will be permitted in any wall zone until stability testing and verification soil nail testing have been completed in that wall zone, and the test results have been approved by the Engineer.

Excavation for soil nail installation shall proceed from the top down in a staged lift sequence as shown on the approved wall earthwork working drawings.

The complete excavated face shall be cleaned of all loose materials, mud, rebound, and other materials that could prevent or reduce shotcrete bond to the excavated face and soil nails.

The Contractor shall remove all cobbles, boulders or portions of boulders, rubble, or debris that are encountered at the final wall alignment during wall face excavation and that protrude from the excavated face more than 50 mm into the design shotcrete thickness as shown on the plans. Such over excavation shall be backfilled with shotcrete.

The Contractor shall immediately notify the Engineer of the occurrence of raveling or local instability of the final wall face excavation or a horizontal movement of the wall face exceeding 0.4 percent of the total excavated wall height.

Unstable areas shall be temporarily stabilized by means of buttressing the exposed excavation face with an earth berm or other methods approved in writing by the Engineer. Construction of the wall in unstable areas shall be suspended until remedial measures, submitted by the Contractor and approved by the Engineer, have been taken.

The Contractor shall protect installed soil nails during excavation and subsequent operations. Damaged soil nails shall be replaced by the Contractor, at the Contractor's expense.

The Contractor shall complete soil nail construction and application of shotcrete wall facing in conformance with the construction sequence in the approved wall earthwork working drawings.

Where the Contractor's excavation and installation methods result in a discontinuous wall along any soil nail row, the ends of the structurally completed wall section shall extend beyond the ends of the next lower excavation lift by a distance equal to twice the lift height. The Contractor shall maintain temporary slopes at the ends of each wall section to ensure slope stability.

No excavation shall proceed to the next underlying excavation lift until the portion of wall in the current excavation lift is structurally complete. A portion of soil nail wall shall be considered structurally complete when:

- A. Soil nail construction has been completed.
- B. Reinforced shotcrete facing has been constructed.
- C. Soil nail grout and shotcrete facing have been cured for at least 72 hours or have attained a minimum compressive strength of 24 MPa.
- D. The soil nail facing anchorage has been attached.
- E. The representative soil nail tests have been completed for that portion of wall.
- F. The soil nail test results have been approved in writing by the Engineer.

Measurement and Payment

Excavation and backfill for soil nail wall construction will be measured and paid for as structure excavation (soil nail wall) and structure backfill (soil nail wall).

Full compensation for stability testing and furnishing, constructing, and removing working and stabilizing berms for soil nail wall construction shall be considered as included in the contract price paid per cubic meter for structure excavation (soil nail wall), and no additional compensation will be allowed therefor.

Full compensation for shotcrete used to fill voids created by the removal of cobbles and boulders or other obstructions shall be considered as included in the contract price paid per cubic meter for shotcrete and no additional compensation will be allowed therefor.

10-1.39 INCLINOMETER

The Contractor shall furnish, install and monitor an inclinometer at Pomerado Road OC, Br. No. 57-0909, east of Abutment 4 as close to the tieback wall as possible and to a depth of at least 10 m below the base of the tieback wall. The location of the inclinometer will be determined by the Engineer. Care shall be taken to install the inclinometer at a location that does not conflict with tiebacks.

The Contractor shall submit a slope inclinometer installation plan to the Engineer for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Submittals shall be signed by an engineer who is registered as a Civil Engineer in the State of California. The Contractor shall allow the Engineer 20 days for review and approval of the slope inclinometer installation plan.

The slope inclinometer installation plan shall include the following:

- A. Materials to be used, procedures, details, and sequences for installing slope inclinometers.
- B. Manufacturer's specifications for the slope inclinometer casing and slope inclinometer probe.
- C. Verification of slope inclinometer probe calibration within the last 12 months.
- D. Resume of personnel performing the installation of the inclinometer casing.
- E. Resume of personnel performing monitoring reading of the slope inclinometer.
- F. Resume of the engineer performing data reduction and reporting of the slope inclinometer monitoring results.

Slope inclinometer casing shall be installed in accordance with the manufacturer's recommendations. In case of conflict between the manufacturer's recommendations and these special provisions, these special provisions shall prevail.

The slope inclinometer casing shall be compatible with the slope indicator probe selected by the Contractor.

Personnel installing the inclinometer casing shall have a minimum of one year experience installing slope inclinometer casings.

Personnel performing monitoring readings of the slope inclinometer shall have a minimum of one year experience collecting slope inclinometer data.

The engineer performing data reduction and reporting of the slope inclinometer results shall have a minimum of two years experience interpreting slope inclinometer data.

The Contractor shall provide a slope inclinometer probe and data readout to measure and record the total movement of the abutment slope.

Slope inclinometer measurements shall be in accordance with the manufacturer's recommendations. In case of conflict between the manufacturer's recommendations and these special provisions, these special provisions shall prevail.

Baseline inclinometer measurements shall be made 14 days prior to the beginning of any construction of the tieback wall or pony bent. Additional inclinometer measurements shall be made at least once every 3 days until the first two upper lifts of tiebacks have been installed and tested. After the first two upper lifts of tiebacks have been installed and tested, inclinometer measurements shall be made at least once every 7 days. More frequent readings shall be performed if requested by the Engineer.

The slope inclinometer field data shall be processed and corrected for bias-shift, rotation, and depth errors. The Contractor shall furnish corrected slope measurements to the Engineer within 24 hours. The submitted measurements shall be reported as graphs displaying the cumulative displacement and incremental displacement of the slope. An electronic copy of the raw data collected in the field shall also be provided to the Engineer. The submittal shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The contract lump sum price paid for inclinometer shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, and monitoring the inclinometer, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.40 SOIL NAIL ASSEMBLY

This work shall consist of drilling holes in existing foundation materials, installing and grouting steel bars in drilled holes, installing anchorage systems, and testing of installed soil nails in conformance with the details shown on the plans, the provisions of the Standard Specifications, and these special provisions.

Working Drawings

The Contractor shall submit a complete working drawing submittal for soil nail assemblies to the Offices of Structure Design in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Working drawings shall be 559 mm x 864 mm in size. For initial review, 5 sets of drawings shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to the Offices of Structure Design for final approval and use during construction.

Working drawing submittals for soil nail assemblies shall show the contract number, structure number, full name of the structure as shown on the project plans, and District-County-Route-Post mile on each drawing and calculation sheet. The Contractor's name, address, and telephone and fax numbers shall also be shown on the working drawings. Each working drawing sheet shall be numbered in the lower right hand corner of the sheet.

The working drawing submittal for soil nail assemblies shall contain all information required for the construction and quality control of the soil nail wall, including the following:

- A. The proposed schedule and detailed construction sequence of the installation and grouting of soil nails, application of shotcrete, and construction of cast-in-place reinforced concrete.
- B. Complete details and specifications for the anchorage system, soil nails, and test soil nails, including encapsulation materials and grouting methods.
- C. Drilling methods and equipment, including proposed drilled hole diameter with assumed bond strength, supporting calculations, and equipment space requirements.
- D. Grout mix designs and testing procedures.
- E. Grout placement procedures and equipment, including minimum required cure time.
- F. Proposed soil nail testing equipment, including jacking frame and appurtenant bracing, and the method and equipment for determining soil nail displacement during testing.
- G. Details for providing bonded and unbonded lengths, including type of packers or other appropriate devices.
- H. Details for isolation of installed proof soil nails during shotcrete installation.
- I. Procedure for extraction of grouted soil nails.

The working drawings shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California.

The Contractor shall allow the Engineer 4 weeks to review the working drawings after a complete submittal has been received.

Should the Engineer fail to review the complete working drawing submittal within the time specified, 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 soil nail working drawing submittal, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Materials

The materials specified below shall be used for construction of soil nail assemblies and test soil nails.

Bar reinforcement for soil nails shall conform to the provisions for bar reinforcement in Section 52, "Reinforcement," of the Standard Specifications. When Grade 420 soil nails are shown on the plans, the bar reinforcement shall also conform to the requirements in ASTM Designation: A 615/A 615M or A 706/A 706M. When Grade 520 soil nails are shown on the

plans, the bar reinforcement shall also conform to the requirements in ASTM Designation: A 615/A 615M. The soil nail shall be a reinforcing bar encapsulated full length in a grouted corrugated plastic sheathing. The bar shall be centered in the sheathing and the space between the sheathing and the bar shall be filled with grout.

Soil nails shall be lengthened or additional soil nails shall be installed if ordered by the Engineer. The lengthening or addition of soil nails, if ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Bar reinforcement for soil nails shall have a minimum length of 150 mm of thread on the anchorage end. Threading may be continuous spiral deformed ribbing provided by the bar deformations or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the bar size shall be the next larger bar designation number from that shown on the plans, and coarse threads shall be used. The epoxy coating at the anchorage end of epoxy-coated bars may be omitted for a maximum length of 150 mm. Metal surfaces of assembled splices of epoxy-coated bars shall be epoxy coated.

Corrugated plastic sheathing shall be either polyvinyl chloride (PVC) or high-density polyethylene (HDPE). The minimum sheathing wall thickness shall be one mm.

HDPE shall have a density between 0.940 and 0.960 grams per cubic centimeter when measured in conformance with the requirements in ASTM Designation: D 792, Test Method A.

The sheathing shall have sufficient strength to prevent damage during construction operations and shall be watertight, chemically stable without embrittlement or softening, and nonreactive with concrete.

Splicing of soil nails shall be made only at the locations shown in the approved working drawings or at ends of soil nails that the Engineer has ordered to be lengthened.

Bar reinforcement for verification and proof test soil nails shall conform to the provisions for bar reinforcement in Section 52, "Reinforcement," of the Standard Specifications and shall be of a size and grade determined by the Contractor. Test soil nail bars shall be not smaller than the production soil nails they represent.

Verification and proof test soil nails shall be lengthened if ordered by the Engineer. The lengthening of test soil nails, if ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Bar reinforcement for verification and proof test soil nails need not be epoxy coated or encapsulated in grouted plastic sheathing. Splicing of test soil nails shall be made only at locations outside of the bonded length.

Anchorage for soil nails shall conform to the details shown on the plans and the provisions in Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications, except that nuts, washers, wedges, and bearing plates to be fully encased in concrete, grout, or shotcrete need not be galvanized. Concrete anchors on bearing plates shall conform to the provisions for stud connectors in Section 55-2, "Materials," of the Standard Specifications.

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. California Test 541 will not be required nor will the grout be required to pass through a screen with a 1.80-mm maximum clear opening prior to being introduced into the grout pump. Fine aggregate may be added to the grout mixture of cement and water in drilled holes 150 mm or greater in diameter, but only to the extent that the cement content of the grout is not less than 500 kg per cubic meter of grout. Fine aggregate, if used, shall conform to the provisions in Section 90-2, "Materials," and Section 90-3, "Aggregate Gradings," of the Standard Specifications. Grout with fine aggregate shall have a nominal penetration equal to or greater than 90 mm when measured in conformance with California Test 533 and shall have an air content of equal to or less than 2 percent when measured in conformance with California Test 504. Air-entraining admixtures shall not be used for grout with fine aggregate.

The consistency of grout with fine aggregate shall be verified prior to use by producing a batch to be tested. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of grout in the soil nails. Grout for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow testing in conformance with California Test 533. The test batch shall demonstrate that the proposed grout mix achieves the specified nominal penetration. Upon completion of the testing, the grout 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.

Construction

No excavation or drilling for the installation of production or proof soil nails will be permitted in any wall zone until stability testing and verification soil nail testing have been completed in that wall zone, and the test results have been approved by the Engineer.

Difficult soil nail assembly construction is anticipated due to caving soils, low overhead clearance, and traffic control.

The Engineer shall be present during drilling, installation, grouting, and testing for verification soil nails.

The Contractor shall determine the required drilled hole diameter and installation method to achieve the soil nail pullout resistance values specified on the plans.

Drilling equipment shall be designed to drill straight and clean holes. The drilling method and the size and capability of the drilling equipment shall be as approved in the working drawings.

At locations where caving conditions are anticipated, sufficient casing and auger lengths shall be available on site to maintain uninterrupted installation of anchors.

At locations where hard drilling conditions such as rock, cobbles, boulders, or obstructions are anticipated, a down hole pneumatic hammer drill rig and drill bit shall be available on site to drill holes for soil nails.

Holes shall be drilled in the existing foundation materials. Holes for verification and proof soil nails shall be of the same diameter as those for the production soil nails they represent.

Holes shall be cleaned to remove material resulting from drilling operations. Water for cleaning holes shall not be used unless approved in writing by the Engineer. Soil nails shall not be installed in the drilled holes until the holes have been inspected by the Engineer.

Soil nails shall be installed in drilled holes in an expeditious manner so that caving or deterioration of the drilled holes does not occur.

Centralizers shall be used during installation to support the soil nail in the center of the drilled hole. Centralizers shall be spaced at a maximum of 2.25 meters on center along the length of the bar, and 150 mm from the end of the bar.

Where the soil nail cannot be completely inserted, the Contractor shall remove the bar and clean or redrill the hole to permit unobstructed installation. Partially installed bars shall not be driven or forced into the drilled hole and will be rejected. When open-hole drilling methods are being used, the Contractor shall have hole cleaning tools on site suitable for cleaning drilled holes along their full length just prior to bar insertion and grouting.

The Contractor may install verification soil nails through the existing slope face, drill platform work bench, stabilization berm, stability test exposed face, or into slot cuts made for the lift in which the verification soil nails are located. Slot cuts shall only be large enough to accommodate the drill and test setup equipment. The verification test nails shall be installed within the limits of each wall test zone or within the limits of the 6-meter excavated stability test face, and shall be at least 3 meters apart.

The length of drilled hole shall be verified and recorded by the Contractor before grouting.

The Contractor shall grout the drilled hole after installation of the soil nail. Grout shall be injected at the low end of the drilled hole and shall fill the drilled hole with a dense grout free of voids or inclusion of foreign material. The Contractor shall completely grout the drilled hole in one continuous operation. Cold joints shall not be used in grout placement.

Only the bonded length of test soil nails shall be grouted.

Soil nails shall be installed and grouted in the same work shift as the drilling operation.

Any remaining void at the exterior end of the drilled hole shall be filled with shotcrete, and the soil nail secured at the face of the shotcrete. The steel bearing plate shall be seated with full bearing on the shotcrete surface, and the nut for the soil nail shall be hand tightened before the initial set of the shotcrete. The nut shall be made wrench tight after the shotcrete has set for 24 hours unless a shorter time is approved by the Engineer.

After placing grout, soil nails shall remain undisturbed for the cure time stated in the approved soil nail working drawings.

The Contractor shall construct verification soil nails using the same equipment, methods, nail inclination, and drill hole diameter as to be used for production soil nails.

Testing

The Contractor shall perform load testing of verification and proof soil nails to verify the Contractor's soil nail installation methods and pullout resistance. Load testing shall consist of incrementally loading the soil nail until either the maximum test load has been held for the specified duration or a pullout failure has occurred. Production soil nails shall be represented by proof soil nails within a given wall zone.

The Contractor shall monitor and record total movement of the test soil nail relative to the grout during application of the test load.

Test loads shall be applied using a hydraulic jack supported by a reaction frame capable of supporting the test equipment without excessive deformation. Test loads shall be maintained within 5 percent of the intended load throughout hold periods. Applied test loads shall be determined by using either a calibrated pressure gage or a load cell. Movements of the soil nail head shall be measured using a gage capable of measuring to 25 μm and recorded to the nearest 25 μm at each increment of load, including the ending alignment load, during the load tests. The gage shall have sufficient capacity to allow the test to be completed without resetting the gage during testing. Unloading and repositioning of test equipment during testing will not be allowed.

The pressure gage shall be graduated in 500 KPa increments or less and shall have an accurately reading dial at least 150 mm in diameter. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will have at final jacking force, and shall be accompanied by a certified calibration chart. Each jack and pressure gage assembly shall be calibrated in conformance with the provisions for jacks used to stress tendons permanently anchored at greater than 25 percent of ultimate tensile strength in Section 50-1.08, "Prestressing," of the Standard Specifications. The load cell shall be calibrated and shall be provided with an indicator capable of measuring the test load in

the soil nail. The range of the load cell shall be such that the lower 10 percent of the manufacturer's rated capacity will not be used in determining the jacking force.

The test load may be verified by State forces with State-furnished operated in conformance with the requirements of California Test 677. The Contractor shall provide sufficient labor, equipment, and material to install and support such testing equipment at the soil nails and to remove the testing equipment after the testing is complete, as ordered by the Engineer.

The Contractor shall furnish to the Engineer complete test results for each soil nail tested. Data for each test shall list key personnel, test loading equipment, soil nail location, hole diameter and depth, bonded length, type of soil, method of drilling, and amount of ground water encountered within the bonded length. Test data shall also include the dates and times of drilling, soil nail installation, grouting, and testing. The test load and amount of displacement shall be included in the test data when any displacement of the soil nail relative to a fixed reference point occurs.

The test load T shall be determined by the following equation:

$$T = L_B \times Q_d$$

Where:

L_B = soil nail bonded length (m), not less than 3 meters

Q_d = design pullout resistance (kN/linear meter), as shown on the plans.

The Contractor shall perform load testing on verification soil nails in the presence of the Engineer. Two verification soil nails shall be installed and tested for each soil nail wall zone listed. Installation and testing of verification soil nails may be performed during stability testing.

The verification test procedure shall conform to the following:

- A. The test shall be conducted by measuring and recording the test load applied to the verification soil nail and the movement of the soil nail head at each load listed in the following loading schedule.

| VERIFICATION TEST | |
|--------------------------------------------|--------------|
| TEST LOAD | HOLD TIME |
| AL (0.10T) | Until Stable |
| 0.20T | 2 minutes |
| 0.40T | 2 minutes |
| 0.60T | 2 minutes |
| 0.80T | 2 minutes |
| 1.00T (Creep Test) | 60 minutes |
| 1.25T | 2 minutes |
| 1.50T (Maximum Test Load) | 10 minutes |
| AL | Until Stable |
| T = Test load as determined by Contractor. | |
| AL = Alignment load = 0.10T | |

- B. Each increment of load shall be applied in less than one minute and held for at least one minute but not more than 2 minutes, except that the creep test load shall be held for 60 minutes. During the creep test, the movement of the soil nail head shall be measured at 1, 2, 3, 4, 5, 6, 10, 20, 30, 40, 50, and 60 minutes. The observation period for the 60-minute load shall start when the pump begins to apply the increment of load from 0.80T to 1.00T.
- C. If the movement measured between 6 minutes and 60 minutes at 1.00T is less than 2.0 mm, the load shall continue to be increased incrementally to 1.50T, then reduced to the ending alignment load.
- D. If the movement measured between 6 minutes and 60 minutes is 2.0 mm or greater, the load shall be reduced to the ending alignment load.

The Contractor shall perform load testing on proof soil nails at locations shown on the plans in the presence of the Engineer. In addition to proof soil nails designated on the plans, the Engineer will instruct the Contractor to install and test 4 additional proof soil nails at locations to be determined by the Engineer.

Proof soil nail testing shall be performed against a temporary bearing yoke that bears directly on the shotcrete facing. Test loads transmitted through the temporary bearing yoke shall not fracture the shotcrete or cause displacement or sloughing of the soil surrounding the drilled hole.

The proof test procedure shall conform to the following:

- A. The proof test shall be conducted by measuring and recording the test load applied to the soil nail and the movement of the soil nail head at each load listed in the following loading schedule.

| PROOF TEST | |
|--------------------------------------------|--------------|
| TEST LOAD | HOLD TIME |
| AL (0.10T) | Until Stable |
| 0.20T | 2 minutes |
| 0.40T | 2 minutes |
| 0.60T | 2 minutes |
| 0.80T | 2 minutes |
| 1.00T (Creep Test) | 10 minutes |
| 1.25T* | 2 minutes |
| 1.50T* | 2 minutes |
| AL | Until stable |
| T = Test load as determined by Contractor. | |
| AL = Alignment load = 0.10T | |
| * Loads for supplemental load testing only | |

- B. Each increment of load shall be applied in less than one minute and held for at least 2 minutes, except that the creep test load shall be held for 10 minutes. During the creep test, the movement of the soil nail head shall be measured and recorded at 1, 2, 3, 4, 5, 6, and 10 minutes. The observation period for the 10-minute load hold shall start when the pump begins to apply the increment of load from 0.80T to 1.00T.
- C. If the load of 1.00T cannot be maintained with 2.0 mm or less of measured movement between one minute and 10 minutes, the 1.00T load shall be maintained for an additional 50 minutes. Soil nail head movement shall be measured at 20, 30, 50, and 60 minutes. A creep curve showing the movement between 6 minutes and 60 minutes shall be plotted as a function of the logarithm of time.
- D. The load shall be reduced to the ending alignment load after creep testing is completed.

Soil nails shall be unloaded only after completion of testing.

A soil nail test will be considered acceptable when:

- A. For verification tests, a total creep movement of less than 2.0 mm is measured between 6 minutes and 60 minutes of creep testing and the creep rate is linear or decreasing in time logarithmic scale between the one-minute and 60-minute readings.
- B. For proof tests, (1) a total creep movement of 2.0 mm or less is measured between one minute and 10 minutes of creep testing, or (2) a creep movement of less than 2.0 mm is measured between 6 minutes and 60 minutes and the creep rate is linear or decreasing in time logarithmic scale between the 6-minute and 60-minute readings.
- C. The total measured movement at the maximum test load less the measured movement at the final alignment load exceeds 80 percent of the theoretical elastic elongation of the soil nail unbonded length.
- D. A pullout failure of the soil nail does not occur. A pullout failure has occurred when attempts to increase the test load result in movement of the soil nail relative to a fixed reference point without an increase in load. The pullout failure load shall be recorded as part of the test data.

The Engineer will select up to one-half of proof test nails for supplemental load testing. Only those proof nails exhibiting a creep movement of less than 2.0 mm in 10 minutes will be considered for supplemental testing. Supplemental testing shall be performed immediately following creep testing. Soil nails selected for supplemental testing shall be tested to the loads and for the durations specified in these special provisions. The test load and movement of the soil nail head shall be recorded, and the results included in the soil nail test data.

Verification soil nails that fail to meet acceptance criteria will be rejected. The Contractor shall submit revised working drawings for additional verification soil nails.

The Engineer will determine the cause of failure for each rejected verification test nail. Installation methods, if determined to be the cause of failure, will be rejected and the Contractor shall include proposed alternative installation methods in the revised working drawings. The Contractor, at the Contractor's expense, shall install additional verification soil nails at the direction of the Engineer until acceptance criteria are met. If the Engineer revises soil nail lengths or nominal pullout resistance values, the replacement verification test nails will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Contractor shall log horizontal borings for additional verification soil nails and submit a test boring report to the Engineer. The soil and rock classification shall conform to the "Soil and Rock Logging Classification Manual: Field Manual" published by the Department. The test boring report shall be signed by a geologist or engineer who is registered as a Geologist or Civil Engineer in the State of California. The logging manual can be obtained by contacting the Transportation Laboratory and is available at:

<http://www.dot.ca.gov/hq/esc/geotech/request.htm>

The test boring report shall include the following:

- A. Summary of drilling methods, drilling equipment, drill platforms, and any drilling difficulties encountered.
- B. Location map of the surveyed position of the new test borings relative to existing and proposed facilities (in California Coordinate System and bridge stationing).
- C. Bore hole survey notes.
- D. Depth increments of borings.
- E. Soil and rock classifications and descriptions.
- F. Photographs of cuttings.
- G. Copies of original daily drilling notes, including dates and weather conditions.

Logging of horizontal test borings and submittal of the test boring report will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Production soil nails represented by proof soil nails that fail to meet acceptance criteria, except those represented by proof soil nails selected for supplemental load testing, will be rejected. The Contractor shall propose alternative installation methods, revise production soil nails, or modify the soil nail plan to the satisfaction of the Engineer. The Contractor shall submit revised working drawings for replacement soil nails. Additional proof test soil nails, production soil nails, installation, and testing, including revised working drawings, shall be at the Contractor's expense.

Verification and proof soil nails shall be removed to 150 mm behind the front face of the shotcrete after testing has been completed, and the void filled with grout.

Verification and proof soil nails shall be extracted when requested by the Engineer, and the void filled with grout.

Measurement and Payment

Soil nail assembly will be measured and paid for by the meter. The length to be paid for will be the length of soil nail assembly or test soil nail measured along the bar centerline from the back face of shotcrete to the tip end shown on the plans or ordered in writing by the Engineer.

The contract price paid per meter for soil nail assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the soil nail assemblies, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Verification and proof test soil nails will be paid for as soil nail assembly.

Full compensation for load testing and extracting verification and proof test soil nails shall be considered as included in the contract price paid per meter for soil nail assembly, and no separate payment will be made therefor.

Full compensation for furnishing, installing, and removing casing shall be considered as included in the contract price paid per meter for soil nail assembly, and no additional compensation will be allowed therefor.

The quantities of trial batch grout will not be included in any contract item of work, and full compensation for furnishing, producing, and disposing of trial batches shall be considered as included in the contract price paid per meter for soil nail assembly, and no additional compensation will be allowed therefor.

Payment for proof soil nails that fail supplemental testing will be reduced by \$3.00 per meter of proof soil nail assembly.

10-1.41 CONTROLLED LOW STRENGTH MATERIAL

Controlled low strength material shall consist of a workable mixture of aggregate, cementitious materials, and water and shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications and these special provisions.

At the option of the Contractor, controlled low strength material may be used as structure backfill for pipe culverts, except that controlled low strength material shall not be used as structure backfill for culverts having a diameter or span greater than 6.1 m.

When controlled low strength material is used for structure backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of 300 mm. This minimum may be reduced to 150 mm when the height of cover is less than or equal to 6.1 m or the pipe diameter or span is less than 1050 mm.

Controlled low strength material in new construction shall not be permanently placed higher than the basement soil. For trenches in existing pavements, permanent placement shall be no higher than the bottom of the existing pavement permeable drainage layer. If a drainage layer does not exist, permanent placement in existing pavements shall be no higher than 25 mm below the bottom of the existing asphalt concrete surfacing or no higher than the top of base below the existing portland cement concrete pavement. The minimum height that controlled low strength material shall be placed, relative to the culvert invert, is 0.5 diameter or 0.5 height for rigid culverts and 0.7 diameter or 0.7 height for flexible culverts.

When controlled low strength material is proposed for use, the Contractor shall submit a mix design and test data to the Engineer for approval prior to excavating the trench for which controlled low strength material is proposed for use. The test data and mix design shall provide for the following:

- A. A 28-day compressive strength between 345 kPa and 690 kPa for pipe culverts having a height of cover of 6.1 m or less and a minimum 28-day compressive strength of 690 kPa for pipe culverts having a height of cover greater than 6.1 m. Compressive strength shall be determined in conformance with the requirements in ASTM Designation: D 4832.
- B. Cement shall be any type of portland cement conforming to the requirements in ASTM Designation: C 150; or any type of blended hydraulic cement conforming to the requirements in ASTM Designation: C 595M or the physical requirements in ASTM Designation: C 1157M. Testing of cement will not be required.
- C. Admixtures may be used in conformance with the provisions in Section 90-4, "Admixtures," of the Standard Specifications. Chemical admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined in conformance with the requirements of California Test 415, shall not be used. If an air-entraining admixture is used, the maximum air content shall be limited to 20 percent. Mineral admixtures shall be used at the Contractor's option.

Materials for controlled low strength material shall be thoroughly machine-mixed in a pugmill, rotary drum or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Controlled low strength material shall be placed in the work within 3 hours after introduction of the cement to the aggregates.

When controlled low strength material is to be placed within the traveled way or otherwise to be covered by paving or embankment materials, the material shall achieve a maximum indentation diameter of 76 mm prior to covering and opening to public traffic. Penetration resistance shall be measured in conformance with the requirements in ASTM Designation: D 6024.

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.

10-1.42 MOVE-IN/MOVE-OUT (EROSION CONTROL)

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Type D, Hydraulic Matrix, or Biofiltration) or Compost, Incorporate, as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer's notification to perform the erosion control work.

Attention is directed to the requirements of erosion control (Type D, Hydraulic Matrix, or Biofiltration) and Compost, Incorporate elsewhere in these special provisions.

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Type D, Hydraulic Matrix, or Biofiltration), and Compost, Incorporate, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of move-in/move-out (erosion control) required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the item of move-in/move-out (erosion control).

10-1.43 EROSION CONTROL (TYPE D)

Erosion control (Type D) includes applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities. Erosion control (Type D) must comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply erosion control (Type D) when an area is ready to receive erosion control as determined by the Engineer and under "Move-in/Move-out (Erosion Control)" of these special provisions.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the ground location of erosion control (Type D) in increments of one hectare or smaller for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached are not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

Seed - (Type 1)

| Botanical Name
(Common Name) | Percent Germination
(Minimum) | Kilograms Pure Live Seed Per Hectare
(Slope Measurement) |
|-------------------------------------------------|----------------------------------|-------------------------------------------------------------|
| Eschscholzia californica*
(California Poppy) | 60 | 25 |
| Lupinus succulentus*
(Arroyo Lupine) | 50 | 25 |
| Lasthenia californica*
(Dwarf Goldfields) | 45 | 10 |
| Leymus triticoides*
(Creeping Wildrye) | 40 | 10 |

*Seed produced in California only.

Seed - (Type 2)

| Botanical Name
(Common Name) | Percent Germination
(Minimum) | Kilograms Pure Live Seed Per Hectare
(Slope Measurement) |
|------------------------------------------------|----------------------------------|-------------------------------------------------------------|
| Eschscholzia californica
(California Poppy) | 60 | 50 |

*Seed produced in California only.

Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

Commercial Fertilizer

Commercial fertilizer shall conform to the provisions in Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and shall have a guaranteed chemical analysis of 6 percent nitrogen, 20 percent phosphoric acid and 20 percent water soluble potash.

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in United States Composting Council's Seal of Testing Assurance program. Compost may be derived from any single, or mixture of any of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials to reduce weed seeds, pathogens and deleterious materials as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminants. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

| Physical/Chemical Requirements | | |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Property | Test Method | Requirement |
| pH | *TMECC 04.11-A, Elastometric pH 1:5 Slurry Method, pH Units | 6.0–8.0 |
| Soluble Salts | TMECC 04.10-A, Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm) | 0-10.0 |
| Moisture Content | TMECC 03.09-A, Total Solids & Moisture at 70+/- 5 deg C, % Wet Weight Basis | N/A |
| Organic Matter Content | TMECC 05.07-A, Loss-On-Ignition Organic Matter Method (LOI), % Dry Weight Basis | 30–65 |
| Maturity | TMECC 05.05-A, Germination and Vigor
Seed Emergence
Seedling Vigor
% Relative to Positive Control | 80 or Above
80 or Above |
| Stability | TMECC 05.08-B, Carbon Dioxide Evolution Rate
mg CO ₂ -C/g OM per day | 8 or below |
| Particle Size | TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis | 95% Passing 16 mm
70% Passing 9 mm |
| Pathogen | TMECC 07.01-B, Fecal Coliform Bacteria < 1000 MPN/gram dry wt. | Pass |
| Pathogen | TMECC 07.01-B, Salmonella < 3 MPN/4 grams dry wt. | Pass |
| Physical Contaminants | TMECC 02.02-C, Man Made Inert Removal and Classification:
Plastic, Glass and Metal, % > 4mm fraction | Combined Total: < 1.0 |
| Physical Contaminants | TMECC 02.02-C, Man Made Inert Removal and Classification:
Sharps (Sewing needles, straight pins and hypodermic needles), % > 4mm fraction | None Detected |

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Before compost application, provide the Engineer with a copy of the compost producer's compost technical data sheet and a copy of the compost producers Seal of Testing Assurance certification. The compost technical data sheet includes:

1. Laboratory analytical test results
2. Directions for product use
3. List of product ingredients

Before compost application, provide the Engineer with a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Stabilizing Emulsion

Stabilizing emulsion must comply with Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion:

1. Must be in a dry powder form
2. Must be a processed organic adhesive used as a soil tackifier
3. May be reemulsifiable

APPLICATION

Apply erosion control materials in separate applications in the following sequence:

1. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Seed (Type 1) –FIRST APPLICATION

| Material | Kilograms Per Hectare
(Slope Measurement) |
|----------|----------------------------------------------|
| Seed | 70 |
| Fiber | 800 |

| Material | Cubic Meter Per Hectare
(Slope Measurement) |
|----------|------------------------------------------------|
| Compost | 2 |

Seed (Type 2) –FIRST APPLICATION

| Material | Kilograms Per Hectare
(Slope Measurement) |
|----------|----------------------------------------------|
| Seed | 50 |
| Fiber | 600 |

| Material | Cubic Meter Per Hectare
(Slope Measurement) |
|----------|------------------------------------------------|
| Compost | 3 |

2. Compost may be dry applied at the total of the rates specified in the preceding table and the following table instead of including it as part of the hydro-seeding operations. In areas where the compost is dry applied, all compost for that area must be applied before the next operation.
3. Apply the following mixture with hydro-seeding equipment at the corresponding rates:

Seed (Type 1) –SECOND APPLICATION

| Material | Kilograms Per Hectare
(Slope Measurement) |
|-------------------------------|----------------------------------------------|
| Fiber | 1800 |
| Commercial Fertilizer | 25 |
| Stabilizing Emulsion (Solids) | 200 |

| Material | Cubic Meter Per Hectare
(Slope Measurement) |
|----------|------------------------------------------------|
| Compost | 3 |

Seed (Type 2) –SECOND APPLICATION

| Material | Kilograms Per Hectare
(Slope Measurement) |
|-------------------------------|----------------------------------------------|
| Fiber | 1000 |
| Commercial Fertilizer | 25 |
| Stabilizing Emulsion (Solids) | 250 |

| Material | Cubic Meter Per Hectare
(Slope Measurement) |
|----------|------------------------------------------------|
| Compost | 3 |

The ratio of total water to total stabilizing emulsion in the mixture must be as recommended by the manufacturer. The Engineer may change the rates of erosion control materials to meet field conditions.

MEASUREMENT AND PAYMENT

Erosion control (Type D) will be measured by the square meter or by the hectare, whichever is designated in the Engineer's Estimate. The area will be calculated on the basis of actual or computed slope measurements.

The contract price paid per square meter or hectare for erosion control (Type D) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Type D) 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 EROSION CONTROL (HYDRAULIC MATRIX)

This work includes applying erosion control materials to embankment and excavation slopes and other areas disturbed by construction activities. Erosion control (hydraulic matrix) must comply with Section 20-3, "Erosion Control," of the Standard Specifications.

Apply erosion control when an area is ready to receive erosion control as determined by the Engineer and under Move-In/Move-Out (Erosion Control) of these special provisions.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control. Prior to applying erosion control, apply and incorporate compost into soil as specified in "Compost, Incorporate" of these special provisions.

Before applying erosion control materials, the Engineer designates the ground location of erosion control in increments of 1 hectare or less for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish tools, labor and materials required to adequately designate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must not contain more than 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tags attached. A container without a seed tag attached is not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

| Seed | | |
|-------------------------------------------------|----------------------------------|-------------------------------------------------------------|
| Botanical Name
(Common Name) | Percent Germination
(Minimum) | Kilograms Pure Live Seed Per Hectare
(Slope Measurement) |
| Lupinus succulentus*
(Arroyo Lupine) | 35 | 25 |
| Lotus scoparius*
(Deerweed) | 50 | 10 |
| Encelia californica*
(Bush Sunflower) | 35 | 10 |
| Eschscholzia californica*
(California Poppy) | 60 | 25 |
| Viguiera laciniata*
(San Diego Sunflower) | 30 | 10 |

*Seed produced in California only.

Seed Sampling Supplies

At the time of seed sampling, furnish a glassine lined bag and custody seal tag for each seed lot sample.

Hydraulic Matrix

Hydraulic matrix consists of a stabilizing emulsion combined with wood fiber and water. Each constituent is mixed in a mechanically agitated hydroseeding equipment and sprayed onto a disturbed soil area as a liquid slurry. Flocculant and tackifier must comply with the specifications in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and be nonflammable, non-toxic to plants and animals, and must have no germination or growth inhibiting factors.

Fiber must comply with Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Fiber must be long strand, whole-wood fibers, thermo mechanically processed from clean, whole-wood chips, containing a minimum of 25 percent at 10 mm long, with a minimum of 50 percent retained on a 710 µm sieve. The wood chips must not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. Fiber must not be produced from sawdust, cardboard, paper, or paper by-products.

Add a coloring agent to the fiber to contrast with the area on which it is applied. The coloring agent must not include copper, mercury, or arsenic and must be biodegradable and nontoxic.

The ratio of fiber to water must be as required to facilitate even application of the material.

Tackifier and flocculant must comply with and be labeled as 1 of the following:

1. Flocculant must be a liquid formulation having polyacrylamide (PAM) as the primary active ingredient and be available as a prepackaged product. The PAM must be a linear, anionic copolymer of acrylamide and sodium acrylate. The residual monomer content of the PAM must not exceed 0.05 percent by weight. Flocculant must be formulated as a water-in-oil emulsion. Flocculant must contain a minimum of 0.30 kg pure PAM per liter and the pure PAM must be a minimum of 30 percent active. The prepackaged product label must indicate that the PAM is registered and approved by the California Department of Food and Agriculture as an auxiliary soil and plant substance, and nonplant food ingredient. If requested provide certification of the percent of pure PAM present by weight; the percent activity, the average molecular weight, and the charge density of the PAM; and provide a material safety data sheet for the prepackaged product. PAM must be added at the following rates (if applicable):

| Slope Gradient | Application Rate
(Kilograms Fiber per Hectare) | PAM Application Rate
(Liters per Hectare) |
|---------------------|---------------------------------------------------|----------------------------------------------|
| < 1V:4H | 2250 | 74.8 |
| > 1V:4H and ≤ 1V:3H | 2800 | 84.1 |
| > 1V:3H and ≤ 1V:2H | 3400 | 93.5 |
| > 1V:2H | 4500 | 93.5 |

2. Tackifier must be a combination of a cross-linked polymer and an organic, high viscosity colloidal polysaccharide with activating agents or a blended hydrocolloid-based binder. The tackifier must be a minimum of 5 percent by weight of the fiber. The tackifier must not dissolve or disperse upon rewetting. Tackifier must be pre mixed and packaged with the wood fiber component.

Before application, submit a Certificate of Compliance for erosion control (hydraulic matrix) under in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance must include a list of pollutant indicators and potential pollutants not visually detectable as described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Storm Water Pollution Prevention Plan and Water Pollution Control Program Preparation Manual of the Storm Water Quality Handbooks issued by the Department.

APPLICATION

Use hydroseeding equipment to apply erosion control to all disturbed soil surfaces. Apply erosion control from 2 or more directions to avoid shadowing effects forming a continuous mat without gaps between the mat and the soil surface. Apply erosion control in layers to avoid slumping and to aid drying. Unless manufacturer guidelines allow for application during wet weather, apply materials during dry weather with a minimum of 24 hours of dry weather between completion of material application and predicted precipitation.

Apply erosion control materials in a single application.

Apply the following mixture at the specified rates within 60 minutes after adding seed to the mixture:

| Material | Slope | Kilograms Per Hectare ^a
(Slope Measurement) |
|------------------|----------------------------|-----------------------------------------------------------|
| Seed | N/A | As specified above |
| Hydraulic Matrix | Slopes < 1V:4H | 2250 |
| Hydraulic Matrix | Slopes > 1V:4H and ≤ 1V:3H | 2800 |
| Hydraulic Matrix | Slopes > 1V:3H and ≤ 1V:2H | 3400 |
| Hydraulic Matrix | Slopes > 1V:2H | 4500 |

^aApplication rate shall be increased by 565 kg hydraulic matrix per hectare for surfaces roughened by techniques such as the following:
sheepsfoot-rolled, ripped, trackwalked, and imprinted.

The ratio of water to fiber and tackifier in the mixture must be as recommended by the manufacturer. The proportions of various erosion control materials may be changed by the Engineer to meet field conditions.

Submit written documentation certifying erosion control was applied in accordance with specified rates, including area of application, time of application, and quantities used.

MAINTENANCE

Reapply erosion control when the area treated exhibits visible erosion. Reapply erosion control within 24 hours of identifying visible erosion.

The General Construction NPDES Permit for soil amendments, including soil stabilization products, requires monitoring for pollutants not visually detectable in storm water.

Erosion control damaged during the progress of work or resulting from your vehicles, equipment, or operations must be repaired or replaced..

MEASUREMENT AND PAYMENT

The quantity of erosion control (hydraulic matrix) to be paid for will be measured by the square meter as determined from measurements along the slope of the actual areas covered by the erosion control (hydraulic matrix.)

The contract price paid per square meter for erosion control (hydraulic matrix) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (hydraulic matrix), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.45 COMPOST, INCORPORATE

This work includes incorporating compost into the surface of areas to receive erosion control (Hydraulic Matrix) as shown on the plans. Compost, incorporate must comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions.

Apply compost when an area is ready to receive it as determined by the Engineer.

Before applying compost, the Engineer designates the location of compost in increments of 1 acre or smaller for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish tools, labor and materials required to designate the various locations.

MATERIALS

Compost

The compost producer must be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate solid waste facilities. If exempt from State permitting requirements, the composting facility must certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.

The compost producer must be a participant in the United States Composting Council's Seal of Testing Assurance program.

Compost may be derived from any single or mixture of any of the following feedstock materials:

1. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products
2. Biosolids
3. Manure
4. Mixed food waste

Compost feedstock materials such that weed seeds, pathogens and deleterious materials are reduced as specified under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.

Compost must not be derived from mixed municipal solid waste and must be reasonably free of visible contaminants. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors.

Metal concentrations in compost must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.

Compost must comply with the following:

Physical and Chemical Requirements

| Property | Test Method | Requirement |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| pH | TMECC 04.11-A
Elastometric pH 1:5 Slurry Method
pH Units | 6.0–8.0 |
| Soluble Salts | TMECC 04.10-A
Electrical Conductivity 1:5 Slurry Method
dS/m (mmhos/cm) | 0–10.0 |
| Moisture Content | TMECC 03.09-A
Total Solids & Moisture at 70+/- 5 deg C
% Wet Weight Basis | 30–60 |
| Organic Matter Content | TMECC 05.07-A
Loss-On-Ignition Organic Matter Method (LOI)
% Dry Weight Basis | 30–65 |
| Maturity | TMECC 05.05-A
Germination and Vigor
Seed Emergence
Seedling Vigor
% Relative to Positive Control | 80 or Above
80 or Above |
| Stability | TMECC 05.08-B
Carbon Dioxide Evolution Rate
mg CO ₂ -C/g OM per day | 8 or below |
| Particle Size | TMECC 02.02-B
Sample Sieving for Aggregate Size Classification
% Dry Weight Basis | Millimeters %
Passing
76.0 99%
9.5 < 25%
Max. Length 100 millimeters |
| Pathogen | TMECC 07.01-B
Fecal Coliform Bacteria
< 1000 MPN/gram dry wt. | Pass |
| Pathogen | TMECC 07.01-B
Salmonella
< 3 MPN/4 grams dry wt. | Pass |
| Physical Contaminants | TMECC 02.02-C
Man Made Inert Removal and Classification:
Plastic, Glass and Metal
% > 4mm fraction | Combined Total:
< 1.0 |
| Physical Contaminants | TMECC 02.02-C
Man Made Inert Removal and Classification:
Sharps (Sewing needles, straight pins and hypodermic needles)
% > 4mm fraction | None Detected |

NOTE: TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Before compost application, submit a copy of the compost producer's compost technical data sheet and a copy of the compost producers Seal of Testing Assurance certification. The compost technical data sheet must include:

1. Laboratory analytical test results
2. Directions for product use
3. List of product ingredients

Before compost application, submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

APPLICATION

Before application of compost, soil surface preparation must comply with Section 19-2.05, "Slopes," of the Standard Specifications. Vegetative growth, temporary erosion control materials, and other debris must be removed from areas to receive compost, incorporate.

Apply and incorporate compost in separate applications in the following sequence to embankment and excavation slopes:

1. Apply compost to a depth of 100 millimeters by using specialized equipment such as a pneumatic blower or side discharge spreader.
2. You may incorporate the compost by hand using a backhoe, bulldozer, or grading blade to a depth of 100 millimeters. Do not incorporate compost to a strip 0.6 meters wide adjacent to the edge of pavement.
3. Following incorporation, compact the area to a relative compaction between 82 percent and 90 percent except as otherwise specified in Section 19-5 "Compaction," of the Standard Specifications.
4. Apply erosion control (Hydraulic Matrix) specified and paid for elsewhere in these special provisions.

MEASUREMENT AND PAYMENT

Compost, incorporate will be measured by the square meter.

The contract price paid per square meter for compost, incorporate includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying compost, incorporate complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.46 EROSION CONTROL (BIOFILTRATION)

Erosion control (Biofiltration) work includes cultivating soil, applying compost and seed, and applying erosion control blanket in swale areas as shown on the plans. Erosion control (Biofiltration) work must comply with Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions. Erosion control (Biofiltration) must conform to the details shown on the plans.

Apply erosion control (Biofiltration) materials when an area is ready to receive erosion control as determined by the Engineer and in conformance with "Move-In/Move-Out (Erosion Control)" of these special provisions.

Before applying erosion control (Biofiltration) materials, the Engineer will designate the ground location of erosion control (Biofiltration) areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed for erosion control (Biofiltration) must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer.

Seed must contain at most 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

| Botanical Name
(Common Name) | Seed | |
|--------------------------------------------------|----------------------------------|-------------------------------------------------------------|
| | Percent Germination
(Minimum) | Kilograms Pure Live Seed Per Hectare
(Slope Measurement) |
| Leymus triticoides *
(Creeping Wildrye) | 40 | 15 |
| Agrostis exarata *
(Spike Bentgrass) | 45 | 10 |
| Eschscholzia californica *
(California Poppy) | 60 | 10 |
| Carex praegracilis *
(Field Sedge) | 35 | 1 |
| Lupinus succulentus *
(Arroyo Lupine) | 50 | 10 |
| Nassella lepida *
(Foothill Needlegrass) | 35 | 1 |

*Seed produced in California only.

Seed Sampling Supplies

At the time of seed sampling, provide the Engineer a glassine lined bag and custody seal tag for each seed lot sample.

Compost

Compost for erosion control (Biofiltration) must comply with "Erosion Control (Type D)" of these special provisions.

Erosion Control Blanket

Erosion control blanket must consist of straw and coconut fiber mats secured in place with wire staples and must conform to the following:

1. Erosion control blanket must be a premanufactured open weave mat consisting of minimum 30% coconut fiber and straw fiber.
2. Straw or combination straw/coconut fiber blankets must be machine produced mats with a lightweight degradable netting on the top and bottom surfaces of the blanket. The straw or coconut fiber must be adhered to the netting with degradable thread or glue strip. The erosion control blanket must have a maximum thickness of 6.35-mm, be of consistent thickness and the straw or coconut fiber must be evenly distributed over the entire area of the blanket. Erosion control blanket must be furnished in rolled strips with a minimum width of 2 m, minimum length of 25 m \pm one m and a maximum mass of 0.27-kg/m².
3. Staples for erosion control blankets must be made of 11-gage minimum steel wire and must be U-shaped with 150-mm legs and 25-mm crown or 200-mm legs and 50-mm crown.

PREPARATION

Biofiltration areas must be prepared as follows before application of compost and erosion control materials:

1. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control (Biofiltration).
2. Biofiltration areas must be cultivated to a minimum depth of 150 mm immediately prior to applying compost. Cultivation must be done until the soil is in a loose condition. Soil clods must not be larger than 25 mm in maximum dimension after cultivation.
3. All rocks larger than 25 mm in maximum dimension on the surface must be removed and disposed of after cultivation.

Removed trash and debris 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.

Upon completion of cultivation, slopes must meet original grade within not more than 0.15 m measured at right angles to the slope.

APPLICATION

Erosion control (Biofiltration) materials must be placed in separate applications in the following order:

1. Compost
2. Seed
3. Erosion control blanket

Apply compost uniformly to a thickness of 50 millimeters.

Seed may be either applied mechanically in a dry condition or with hydro seeding equipment. If you elect to hydro-seed, a minimum of 600 kg of fiber per hectare must be mixed and applied with the seed. The fiber must be furnished and applied at no expense to the State.

If seed is applied with hydro-seeding equipment it must be applied within 60 minutes after the seed has been added to the hydro-seeder.

Erosion control blanket must be installed over the compost and seed application, on the same day the compost and seed are applied.

Erosion control blanket strips must be placed loosely on the biofiltration area with the longitudinal joints perpendicular to the length of the biofiltration area. Longitudinal and transverse joints of blankets must be overlapped according to the manufacturer's recommendations and stapled. Staples must be driven perpendicular to the length of the biofiltration area, and must be located and spaced in conformance with the manufacturer's instructions. Ends of the blankets must be secured in place in conformance with the manufacturer's instructions.

Erosion control (Biofiltration) work must extend to the edge of the biofiltration area, as shown on the plans.

Erosion control (Biofiltration) areas must be watered in conformance with "Truck Watering" of these special provisions.

MEASUREMENT AND PAYMENT

The quantity of erosion control (Biofiltration) will be determined by the square meter from actual measurement of the biofiltration area covered by the erosion control blanket, not including overlaps.

The contract price paid per square meter for erosion control (Biofiltration) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Biofiltration), including cultivation, providing and applying seed, and erosion control blanket, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.47 FIBER ROLLS

Fiber rolls shall be furnished and installed in conformance with details shown on the plans and these special provisions and as directed by the Engineer.

Fiber rolls shall be installed on excavation and embankment slopes and other disturbed soil areas.

At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh at least 0.81-kg/m. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a photodegradable plastic or biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Fiber rolls shall be installed as follows:

1. Fiber rolls (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Fiber rolls (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6.0 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Fiber rolls shall be installed approximately parallel to the slope contour.
6. Fiber rolls shall be installed before the application of other erosion control or soil stabilization materials in the same area.

If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including furrow excavation and backfill, repairing or replacing fiber rolls as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

10-1.48 TRUCK WATERING

Truck watering shall consist of watering erosion control (Biofiltration) areas, as shown on the plans, as specified in these special provisions and as directed by the Engineer.

Truck watering shall start on the day following application of erosion control (Biofiltration) and continue until the start of the first rainy season following seed application except as ordered by the Engineer. Watering during the rainy season, as directed by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Water shall be applied by hand (hose) in such a manner that the erosion control (Biofiltration) is not damaged during watering and soil erosion and riling shall be prevented.

Water shall be applied in sufficient quantity to germinate and maintain active growth of the erosion control (Biofiltration) seed mix.

The contract lump sum price paid for truck watering shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in truck watering, (including water), as specified in these special provisions, and as directed by the Engineer.

10-1.49 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 corrugated high density polyethylene (CHDPE) pipe. Corrugated high density polyethylene pipe shall conform to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

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.

10-1.50 EXTEND IRRIGATION CROSSOVERS

Extend existing irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Extend irrigation crossovers shall include conduit, water line crossover, and sprinkler control crossover extensions and appurtenances, locating existing irrigation crossovers and pressure testing existing and new water line crossovers. The sizes of conduit, water line crossover, and sprinkler control crossover extensions shall be as shown on the plans.

Before work is started in an area where an existing irrigation crossover conduit is to be extended, the existing conduit shall be located by the Contractor. When exploratory holes are used to locate the existing conduit, the exploratory holes shall be excavated in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

If debris is encountered in the ends of conduits to be extended, the debris shall be removed prior to extending conduits. Removal of debris within the first meter in the conduits shall be at the Contractor's expense. If debris is encountered in the conduit more than one meter from the ends of the conduits to be extended, the additional debris shall be removed as directed by the Engineer and will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Prior to installation of water line crossover extensions, the existing water lines shall be pressure tested for leakage in conformance with the provisions in Section 20-5.03H, "Pressure Testing," of the Standard Specifications. Repairs to the existing water line crossover, when ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Conduit extensions shall be corrugated high density polyethylene (CHDPE) pipe.

Water line crossover extensions shall be plastic pipe (PR 315) (supply line).

Sprinkler control crossover extensions shall be Type 3 electrical conduit.

Conductors shall be removed from existing sprinkler control crossovers to be extended.

After installation of the sprinkler control crossover extensions, new conductors shall be installed without splices in existing and extended sprinkler control crossovers. New conductors shall match the removed conductors in color and size and shall be spliced to the existing conductors in adjacent pull boxes. After the new conductors are installed, the conductors shall be tested in the same manner specified for traffic signal, sign illumination, and lighting circuits in conformance with the provisions in Section 86-2.14B, "Field Testing," of the Standard Specifications.

After water line crossover extensions have been installed, existing and extended water line crossovers shall be retested for leakage in conformance with the provisions in Section 20-5.03H, "Pressure Testing," of the Standard Specifications. Leaks that develop shall be repaired at the Contractor's expense and the water line crossovers shall be retested until a satisfactory pressure test is achieved.

10-1.51 FINISHING ROADWAY

Finishing roadway shall conform to the provisions in Section 22, "Finishing Roadway," of the Standard Specifications.

10-1.52 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 30 m measured horizontally of any culvert, watercourse, or bridge.

10-1.53 TREATED PERMEABLE BASE

Treated permeable base shall be asphalt treated and shall conform to the provisions in Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.

The type of asphalt binder to be mixed with aggregate for treated permeable base shall be Grade PG 70-10 conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.

10-1.54 ASPHALT CONCRETE

GENERAL

Asphalt concrete and asphalt concrete base shall be Type A and shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

The grade of asphalt binder to be mixed with aggregate for Type A asphalt concrete, except for dikes, shall be Grade PG 64-10 conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.

The grade of asphalt binder to be mixed with aggregate for Type A asphalt concrete dikes shall be Grade PG 70-10 conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.

The asphalt content of the asphalt mixture will be determined in conformance with the requirements in California Test 379, or in conformance with the requirements in California Test 382.

The amount of asphalt binder used in asphalt concrete placed in dikes, gutters, gutter flares, overside drains and aprons at the ends of drainage structures shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way.

When portland cement concrete is placed on asphalt concrete base, the finished surface of the asphalt concrete base shall not extend above the grade established by the Engineer. Asphalt concrete base with a surface higher than the grade established by the Engineer shall be cold planed until the surface of asphalt concrete base conforms to the tolerances specified. Cold planing equipment shall be power driven and specifically designed to produce a smooth surface that conforms to the straight edge requirements specified in Section 39-6.03, "Compacting" of the Standard Specifications. Asphalt concrete base with a surface lower than 15 mm below the grade established by the Engineer shall be removed and replaced with asphalt concrete base which complies with requirements of these specifications.

The miscellaneous areas to be paid for at the contract price per square meter for place asphalt concrete (miscellaneous area), in addition to the prices paid for the materials involved, shall be limited to the areas listed on the plans.

Aggregate for asphalt concrete dikes and miscellaneous areas shall be in conformance with the provisions for 9.5-mm Maximum grading in Section 39-2.02, "Aggregate," of the Standard Specifications.

If the Contractor selects the batch mixing method, asphalt concrete shall be produced by the automatic batch mixing method in conformance with the provisions in Section 39-3.03A(2), "Automatic Proportioning," of the Standard Specifications.

Asphalt concrete surfacing shall be placed on existing surfacing, including curve widening, chain control lanes, turnouts, left turn lanes, and public and private road connections shown on the plans, unless otherwise directed by the Engineer.

Additional asphalt concrete surfacing material shall be placed along the edge of the surfacing at road connections and private drives, hand raked, if necessary, and compacted to form smooth tapered conforms. Full compensation for furnishing all labor and tools and for doing all the work necessary to hand rake these conforms shall be considered as included in the contract prices paid per tonne for the various items of asphalt concrete surfacing involved and no additional compensation will be allowed therefor.

RECLAIMED ASPHALT PAVEMENT

The Contractor may produce asphalt concrete Type A and Type B using reclaimed asphalt pavement (RAP). Asphalt concrete produced using RAP shall conform to the provisions for asphalt concrete in this section, "Asphalt Concrete," and these special provisions. The Contractor may substitute RAP for a portion of the virgin aggregate in asphalt concrete in an amount not exceeding 15 percent of the asphalt concrete dry aggregate mass.

RAP shall be processed from asphalt concrete removed from pavement surfaces. RAP shall be stored in stockpiles on smooth surfaces free of debris and organic material. RAP stockpiles shall consist only of homogeneous RAP. The Contractor may process and stockpile RAP throughout the project's life. Processing and stockpiling operations shall prevent material contamination and segregation.

The Contractor shall determine the amount of asphalt binder to be mixed with the combined virgin aggregate and RAP in conformance with the requirements in California Test 367 amended by Lab Procedure-9 (LP-9), "Asphalt Concrete Using Up To 15% Reclaimed Asphalt Pavement (RAP)." LP-9 is available at:

<http://www.dot.ca.gov/hq/esc/Translab/fpmlab.htm>

At least 20 days before starting production of asphalt concrete using RAP, the Contractor shall submit a proposed asphalt concrete mix design in writing to the Engineer. The mix design submittal shall consist of the following:

A. RAP:

1. Processed stockpile locations.
2. LP-9 test results.
3. Correlation factor for aggregate gradations from California Test 382 and LP-9.
4. Three 32-kg samples of processed RAP representing the material to be used. The three samples shall be split from the sample the Contractor uses to determine the mix design. The Contractor shall obtain and split the samples in conformance with the requirements in California Test 125 and LP-9.
5. The substitution rate for virgin aggregate and percent RAP.

B. Virgin aggregate and supplemental fine aggregate blend:

1. Percent passing values for each sieve size.
2. Aggregate quality tests results.
3. Each aggregate source to be used including producer, location, and California Mine Identification number.
4. Percentage of each aggregate stockpile, cold feed, and hot bin to be used.
5. Gradation of each aggregate stockpile, cold feed, and hot bin to be used.

C. Asphalt binder:

1. Source.
2. Material Safety Data Sheets.

D. Antistrip additives, if used:

1. Name of product.
2. Name of manufacturer.
3. Manufacturer's designation and proposed rate.
4. Location and method of addition.
5. Material Safety Data Sheets.

E. Asphalt concrete:

1. A completed mix design that reflects the percent of RAP to be used including the electronic worksheet identified in LP-9.
2. In graphical format, stability and air voids versus asphalt binder percentage of asphalt in conformance with the requirements in CTM 367.

Asphalt concrete production using RAP shall not begin until the Engineer approves the mix design. If the Engineer fails to review the mix design in 20 days, and if, in the opinion of the Engineer, work completion is delayed as a result of the failure to review, the Engineer will adjust payment and contract time in conformance with the requirements in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

If proposing a change in the RAP substitution rate, the Contractor shall notify the Engineer. If the substitution rate changes more than 5 percent by dry aggregate mass in the asphalt concrete mixture, the Contractor shall submit a new mix design.

The aggregate gradation for the asphalt concrete produced with RAP shall be calculated based on the mathematical combination of the virgin aggregate gradation during production and the daily RAP gradation. RAP shall be sampled and gradation shall be determined in conformance with the requirements in LP-9. RAP gradations shall be:

- A. Determined daily by the Contractor.
- B. Used for the mathematical combination of that day's asphalt concrete production.
- C. Reported to the Engineer.

The Contractor shall perform quality control testing of the RAP source each day asphalt concrete using RAP is produced. The Contractor shall perform quality control testing of the aggregates and the asphalt concrete mixture at least once for every 1000 tonnes of asphalt concrete using RAP produced, but not less than 2 tests per day.

Daily, the Contractor shall submit to the Engineer:

- A. Results for RAP gradation and the asphalt binder content in RAP determined in conformance with the requirements in LP-9. The Contractor shall sample RAP from the weighhopper or pugmill.
- B. Mathematical calculation of the gradation of the virgin aggregate and RAP aggregate blend.
- C. Correlation factor for RAP burn-off determined in conformance with the requirements in LP-9.

RAP proportioning shall conform to the provisions for aggregate proportioning specified in Section 39-3.03, "Proportioning," of the Standard Specifications and these special provisions. The Contractor's mixing equipment shall have a device that safely provides a sample representative of the virgin aggregate and RAP incorporated into the asphalt concrete. The Contractor shall sample in conformance with the requirements in California Test 125 and LP-9.

The temperature of asphalt concrete using RAP shall not exceed 165°C.

If batch mixing is used, RAP shall be kept separate from the virgin aggregate until both ingredients enter the weighhopper or pugmill. After introduction to the pugmill and before asphalt binder is added, the mixing time for the virgin aggregate and RAP shall not be less than 5 seconds. After asphalt binder is added, the mixing time shall not be less than 30 seconds.

If continuous mixing is used, the RAP shall be protected from direct contact with the burner flame with a device such as a shield, separator, or second drum.

PAINT BINDER (TACK COAT)

Paint binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer.

Paint binder (tack coat) shall be, at the option of the Contractor, either slow-setting asphaltic emulsion, rapid-setting asphaltic emulsion or paving asphalt. Slow-setting asphaltic emulsion and rapid-setting asphaltic emulsion shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications. When paving asphalt is used for paint binder, the grade will be determined by the Engineer. Paving asphalt shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 92, "Asphalts," of the Standard Specifications.

Paint binder (tack coat) shall be applied in the liter per square meter range limits specified for the surfaces to receive asphalt concrete in the tables below. The exact application rate within the range will be determined by the Engineer.

| Application Rates for Asphaltic Emulsion Paint Binder (Tack Coat) on Asphalt Concrete (except Open Graded) and on Portland Cement Concrete Pavement (PCCP) | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|
| Type of surface to receive paint binder (tack coat) | Slow-Setting Asphaltic Emulsion
L/m ² (Note A) | Rapid-Setting Asphaltic Emulsion
L/m ² (Note B) |
| Dense, compact surfaces, between layers, and on PCCP | 0.20 – 0.35 | 0.10 – 0.20 |
| Open textured, or dry, aged surfaces | 0.35 – 0.90 | 0.20 – 0.40 |

Note A: Slow-setting asphaltic emulsion is asphaltic emulsion diluted with additional water. Water shall be added and mixed with the asphaltic emulsion (containing up to 43 percent water) so the resulting mixture contains one part asphaltic emulsion and not more than one part added water. The water shall be added by the emulsion producer or at a facility that has the capability to mix or agitate the combined blend.

Note B: Undiluted rapid-setting asphaltic emulsion.

| Application Rates for Paint Binder (Tack Coat) on
Asphalt Concrete (except Open Graded) and on Portland Cement
Concrete Pavement (PCCP) | |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Type of surface to receive paint binder (tack coat) | Paving Asphalt
L/m ² |
| Dense, compact surfaces, between layers, and on
PCCP | 0.05 – 0.10 |
| Open textured, or dry, aged surfaces | 0.10 – 0.25 |

When asphaltic emulsion is used as paint binder (tack coat), asphalt concrete shall not be placed until the applied asphaltic emulsion has completely changed color from brown to black.

The area to which paint binder has been applied shall be closed to public traffic. Care shall be taken to avoid tracking binder material onto existing pavement surfaces beyond the limits of construction.

COMPACTION

Asphalt concrete and asphalt concrete base placed in layers of 45 mm or less in compacted thickness or widths of less than 1.5 m shall be spread and compacted with the equipment and by the methods conforming to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications. Other asphalt concrete and asphalt concrete base shall be compacted and finished in conformance with the provisions in Section 39 and the following:

- A. The provisions in Section 39-5.02, "Compacting Equipment," of the Standard Specifications shall not apply.
- B. The Contractor shall furnish a sufficient number of rollers to obtain the compaction specified in these special provisions and the surface finish required by the Standard Specifications and these special provisions.
- C. Rollers shall be equipped with pads and water systems that prevent sticking of asphalt mixtures to the pneumatic-tired or steel-tired wheels. A parting agent that will not damage the asphalt mixture may be used.
- D. The second paragraph in Section 39-6.01, "General Requirements," of the Standard Specifications shall not apply.
- E. Asphalt concrete and asphalt concrete base shall be compacted to obtain the specified relative compaction before the temperature of the mixture drops below 65°C. Additional rolling to achieve the specified relative compaction will not be permitted after the temperature of the mixture drops below 65°C or once the pavement is opened to public traffic. When vibratory rollers are used as finish rollers the vibratory unit shall be turned off.
- F. The fifth and seventh through tenth paragraphs of Section 39-6.03, "Compacting," of the Standard Specifications shall not apply.
- G. Asphalt concrete and asphalt concrete base shall be compacted to a relative compaction of not less than 96 percent and shall be finished to the lines, grades, and cross section shown on the plans. In-place density of asphalt concrete and asphalt concrete base will be determined before opening the pavement to public traffic.
- H. Relative compaction will be determined by California Test 375.
- I. If the test results for a quantity of asphalt concrete or asphalt concrete base indicate that the relative compaction is below 96 percent, the Contractor will be notified. Asphalt concrete or asphalt concrete base spreading operations shall not continue until the Contractor has notified the Engineer of the adjustment that will be made in order to meet the specified relative compaction.
- J. If the test results for a quantity of asphalt concrete or asphalt concrete base indicate that the relative compaction is less than 96 percent, the asphalt concrete or asphalt concrete base represented by that quantity shall be removed, except as otherwise provided in these special provisions. If requested by the Contractor and approved by the Engineer, asphalt concrete or asphalt concrete base with a relative compaction of 93 percent or greater may remain in place and the Contractor shall pay to the State the amount of reduced compensation for the quantity with relative compaction less than 96 percent and greater than or equal to 93 percent. The Department will deduct the amount of reduced compensation from moneys due, or that may become due, the Contractor under the contract. The amount of reduced compensation the Contractor shall pay to the State will be calculated using the total tonnes in the quantity with relative compaction less than 96 percent and greater than or equal to 93 percent multiplied by the contract price per tonne for asphalt concrete or asphalt concrete base involved multiplied by the following compensation factors:

| Relative Compaction
(Percent) | Reduced Compensation
Factor | Relative Compaction
(Percent) | Reduced Compensation
Factor |
|----------------------------------|--------------------------------|----------------------------------|--------------------------------|
| 96.0 | 0.000 | 94.4 | 0.062 |
| 95.9 | 0.002 | 94.3 | 0.068 |
| 95.8 | 0.004 | 94.2 | 0.075 |
| 95.7 | 0.006 | 94.1 | 0.082 |
| 95.6 | 0.009 | 94.0 | 0.090 |
| 95.5 | 0.012 | 93.9 | 0.098 |
| 95.4 | 0.015 | 93.8 | 0.108 |
| 95.3 | 0.018 | 93.7 | 0.118 |
| 95.2 | 0.022 | 93.6 | 0.129 |
| 95.1 | 0.026 | 93.5 | 0.142 |
| 95.0 | 0.030 | 93.4 | 0.157 |
| 94.9 | 0.034 | 93.3 | 0.175 |
| 94.8 | 0.039 | 93.2 | 0.196 |
| 94.7 | 0.044 | 93.1 | 0.225 |
| 94.6 | 0.050 | 93.0 | 0.300 |
| 94.5 | 0.056 | | |

LONGITUDINAL JOINTS

A vertical longitudinal joint of more than 45 mm will not be allowed at any time between adjacent lanes open to public traffic.

The Contractor shall schedule paving operations so that each layer of asphalt concrete is placed on contiguous lanes of the traveled way during each work shift. At the end of each work shift, the distance between the ends of the layers of asphalt concrete on adjacent lanes shall not be greater than 3 m or less than 1.5 m. Additional asphalt concrete shall be placed along the transverse edge at the end of each lane and along the exposed longitudinal edges between adjacent lanes, hand raked, and compacted to form temporary conforms. Kraft paper, or other approved bond breaker, may be placed under the conform tapers to facilitate the removal of the taper when paving operations resume.

Shoulders or median borders adjacent to a lane being paved shall be surfaced prior to opening the lane to public traffic.

AUTOMATIC SCREED CONTROL

In addition to the provisions in Section 39-5.01, "Spreading Equipment," of the Standard Specifications, asphalt paving equipment shall be equipped with automatic screed controls and a sensing device or devices.

When placing asphalt concrete to the lines and grades established by the Engineer, the automatic controls shall control the longitudinal grade and transverse slope of the screed. Grade and slope references shall be furnished, installed, and maintained by the Contractor. Should the Contractor elect to use a ski device, the minimum length of the ski device shall be 9 m. The ski device shall be a rigid one piece unit and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device not less than 9 m long. The end of the screed farthest from centerline shall be controlled by a sensor activated by a similar ski device or by an automatic transverse slope device set to reproduce the cross slope designated by the Engineer.

When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 3-mm tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same way it was controlled when placing the initial mat.

Should the methods and equipment furnished by the Contractor fail to produce a layer of asphalt concrete conforming to the provisions, including straightedge tolerance, of Section 39-6.03, "Compacting," of the Standard Specifications, the paving operations shall be discontinued and the Contractor shall modify the equipment or methods, or furnish substitute equipment.

Should the automatic screed controls fail to operate properly during a day's work, the Contractor may manually control the spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the provisions in this section before starting another day's work.

PROFILING

In addition to the straightedge provisions in Section 39-6.03, "Compacting," of the Standard Specifications, asphalt concrete pavement shall conform to the surface tolerances specified herein.

The uppermost layer of Type A asphalt concrete surfacing shall be profiled in the presence of the Engineer using a California Profilograph or equivalent in conformance with California Test 526 and as specified in these special provisions.

The California Profilograph or equivalent will not be required for the following areas of the pavement surface but shall conform to the straightedge requirements in Section 39-6.03, "Compacting," of the Standard Specifications:

1. Pavement with a total thickness less than 75 mm.
2. Pavement on horizontal curves with a centerline curve radius of less than 300 m and the pavement within the superelevation transition on those curves.
3. Pavement placed in a single lift when required by the special provisions.
4. Pavement with extensive grade or cross slope correction which does not receive advance leveling operations in conformance with the provisions in Section 39-6.02, "Spreading," of the Standard Specifications.
5. Pavement for ramps and connectors with steep grades and high rates of superelevation, as determined by the Engineer.
6. Pavement sections of city or county streets and roads, and turn lanes and collector lanes that are less than 500 m in length.
7. Shoulders and miscellaneous areas.
8. Pavement placed within one meter from and parallel with the joint between asphalt concrete pavement and existing curbs, gutters or existing pavement.
9. Pavement surface within 15 m of a transverse joint that separates the pavement from an existing pavement, approach slab or structure surface not constructed under the contract.

The Contractor shall conform to California Test 526, except a zero (null) blanking band shall be used for determining the Profile Index. Prior to beginning profiles, the profilograph shall be calibrated in the presence of the Engineer. Two profiles shall be obtained within each traffic lane, one meter from and parallel with the edges of the lane.

Pavements profiled shall conform to the following Profile Index requirements:

1. Pavement on tangent alignment and pavement on horizontal curves having a centerline curve radius of 600 m or more shall have a Profile Index of 48 mm or less for each 0.1-km section profiled.
2. Pavement on horizontal curves having a centerline curve radius of 300 m or more but less than 600 m, including the pavement within the superelevation transition of these curves, shall have a Profile Index of 96 mm or less for each 0.1-km section profiled.
3. Pavement within any 0.1-km section, containing high point areas with deviations in excess of 7.5 mm in a length of 7.5 m or less, when tested in conformance with the requirements in California Test 526, shall be corrected by the Contractor regardless of the Profile Index.

The Contractor shall complete initial runs of the profilograph prior to opening the pavement to public traffic. Profilograph operations shall be in conformance with the lane closure requirements in "Maintaining Traffic" of these special provisions. If initial profiles can not be made prior to opening the pavement to public traffic, the initial runs of the profilograph shall be made the next day that traffic control is permitted for the area to be profiled.

Areas of the top surface of the uppermost layer of Type A asphalt concrete pavement that do not meet the specified surface tolerances shall be brought within tolerance by abrasive grinding.

Abrasive grinding shall be performed to reduce individual deviations in excess of 7.5 mm, and to reduce the Profile Index of the pavement to be within the specified tolerance. Areas which have been subjected to abrasive grinding shall receive a seal coat. Deviations in excess of 7.5 mm which cannot be brought into specified tolerance by abrasive grinding shall be corrected by either (1) removal and replacement or (2) placing an overlay of asphalt concrete. The corrective method for each area shall be selected by the Contractor and shall be approved by the Engineer prior to beginning the corrective work. Replacement or overlay pavement not meeting the specified tolerances shall be corrected by the methods specified above. Corrective work shall be at the Contractor's expense except that flagging costs will be paid for in conformance to the provisions in Section 12-2, "Flagging," of the Standard Specifications. The Contractor shall run profilograms on the areas that have received abrasive grinding or corrective work until the final profilograms indicate the Profile Index of the area is within the specified tolerance.

When abrasive grinding is used to bring the top surface of the uppermost layer of asphalt concrete surfacing within the specified surface tolerances, additional abrasive grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel with, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within a ground area. Ground areas shall be neat rectangular areas of uniform surface appearance.

The original of the final profilograms that indicate the pavement surface is within the Profile Index specified shall become the property of the State and shall be delivered to the Engineer prior to acceptance of the contract.

Full compensation for performing all profile checks for Profile Index and furnishing final profilograms to the Engineer, for performing all corrective work to the pavement surface including abrasive grinding, removing, and replacing asphalt concrete or placing an asphalt concrete overlay to bring the surface within the tolerance specified shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and no separate payment will be made therefor.

AGGREGATE CLEANNESS

The aggregate from each separate bin used for asphalt concrete, Type A, and asphalt concrete base, Type A, except for the bin containing the fine material, shall have a Cleanness Value of 57 minimum for contract compliance and a value of 65 minimum for operating range as determined by California Test 227, modified as follows:

1. Tests will be performed on the material retained on the 2.36-mm sieve from each bin and will not be a combined or averaged result.
2. Each test specimen will be prepared by hand shaking for 30 seconds, a single loading of the entire sample on a 305-mm diameter, 4.75-mm sieve, nested on top of a 305-mm diameter, 2.36-mm sieve.
3. Where a coarse aggregate bin contains material which will pass the maximum size specified and is retained on a 9.5-mm sieve, the test specimen mass and volume of wash water specified for 25-mm x 4.75-mm aggregate size will be used.
4. Samples will be obtained from the weigh box area during or immediately after discharge from each bin of the batching plant or immediately prior to mixing with asphalt in the case of continuous mixers.
5. The Cleanness Value of the test sample from each of the bins will be separately computed and reported.

At drier-drum and continuous plants with cold feed control, Cleanness Value test samples will be obtained from the discharge of each coarse aggregate storage. An aggregate sampling device shall be provided which will provide a 25-kg sample of each coarse aggregate.

If the results of the Cleanness Value tests do not meet the requirements specified for operating range but meet the contract compliance requirements, placement of the material may be continued for the remainder of that day. However, another day's work may not be started until tests, or other information, indicate to the satisfaction of the Engineer that the next material to be used in the work will comply with the requirements specified for operating range.

If the results of the Cleanness Value tests do not meet the requirements specified for contract compliance, the material which is represented by these tests shall be removed. However, if requested by the Contractor and approved by the Engineer, material having a Cleanness Value of 48 or greater may remain in place and accepted on the basis of a reduced payment for material left in place.

Asphalt concrete or asphalt concrete base that is accepted on the basis of reduced payment will be paid for at the contract prices for the items of asphalt concrete and asphalt concrete base involved multiplied by the following factors:

| Test Value | Pay Factor |
|------------|------------|
| 56 | 0.90 |
| 55 | 0.85 |
| 54 | 0.80 |
| 53 | 0.75 |
| 52 | 0.70 |
| 51 | 0.65 |
| 50 | 0.60 |
| 49 | 0.55 |
| 48 | 0.50 |

If asphalt concrete or asphalt concrete base is accepted on the basis of reduced payment due to a Cleanness Value of 48 to 56 and also accepted on the basis of aggregate grading or Sand Equivalent tests not meeting the contract compliance requirements, the reduced payment for Cleanness Value shall apply and payment by the Contractor to the State for asphalt concrete or asphalt concrete base not meeting the contract compliance requirements for aggregate grading or Sand Equivalent shall not apply.

10-1.55 JOINTED PLAIN CONCRETE PAVEMENT

GENERAL

Jointed plain concrete pavement shall be constructed in conformance with the provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions, and as shown on the plans.

Insert method for forming joints in pavement shall not be used.

PREPAVING CONFERENCE

Supervisory personnel of the Contractor and subcontractors who are to be involved in the concrete paving work shall meet with the Engineer at a prepaving conference, at a mutually agreed time, to discuss methods of accomplishing the paving work.

The Contractor shall provide a facility for the prepaving conference within 5 km of the construction site or at a nearby location agreed to by the Engineer. Attendance at the prepaving conference is mandatory for the Contractor's project superintendent, paving construction foreman, subcontractor's workers, including foremen and personnel performing saw cutting, joint sealing, concrete plant manager, and concrete plant operator. Conference attendees shall sign an attendance sheet provided by the Engineer. Production and placement shall not begin nor proceed unless the above-mentioned personnel have attended the mandatory prepaving conference.

TEST STRIP

At the beginning of paving operations, the Contractor shall construct a test strip of concrete pavement from 200 m to 300 m in length. The paving width for the test strip shall be the same as that intended by the Contractor for production work. The Contractor shall use the same equipment to construct the test strip for the remainder of the paving operations, except as specified in this section. The Contractor shall not begin paving operations until the test strip has been evaluated in conformance with the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications regarding surface straight edge requirements, and "Profile Index" in this section; for dowel alignment verification; concrete quality (except modulus of rupture); and pavement thickness. Additional test strips will be required when:

1. A portion of a test strip fails to conform to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications for straight edge requirements;
2. A portion of the test strip fails to conform to profile requirements;
3. The Contractor proposes different paving equipment, including a batch plant, paver, dowel bar inserter, tie bar inserter, tining, or curing equipment;
4. The dowel bar tolerances are not met;
5. The pavement thickness deficiency is greater than 15 mm after grinding; or
6. A change in concrete mix proportions has occurred.

The Contractor shall perform coring of the test strips as part of the dowel placement tolerance verification, and pavement thickness verification. The Engineer will select a minimum of six dowel bars that will be cored for each test strip. After removal of cores, voids in concrete pavement shall be cleaned and filled with hydraulic cement grout conforming to the provisions in "Core Drilling for Dowel Placement Alignment Assurance Testing" in this section.

Before mechanical dowel bar inserters are used, the Contractor shall demonstrate that the insertion equipment will not leave surface irregularities such as depressions, dips, or high areas adjacent to the dowel bar insertion point, or voids or segregation around dowel bars.

Before placement of the test strip, the Contractor shall submit a written procedure to locate transverse weakened plane joints that will coincide with the center of the dowel bars being placed and locating the tie bars along the longitudinal joints. This procedure shall be submitted prior to the prepaving conference, and shall describe the control of inadvertent covering of paint markings after applying curing compound, excessive paint spray producing too large a paint dot marking for the accuracy required, misalignment by transferring marking spots, and inadequate staking of joints.

Construction of concrete pavement shall not proceed until the Engineer has completed an evaluation of the test strip. The Engineer shall be allowed 3 days, not including Saturdays, Sundays and legal holidays, to evaluate the test strip. If, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the Engineer not completing the evaluation of the test strip within the time specified, 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. Test strips failing

to conform to the specifications for concrete pavement shall be removed. Additional test strips shall be constructed until the Contractor constructs a test strip that conforms to the specifications for concrete pavement. Additional test strips shall conform to the requirements in this section, except the test strip shall be 200 m in length.

Prior to constructing additional test strips, the Contractor shall change methods or equipment to construct a test strip that conforms to the provisions in Section 40-1.10, "Final Finishing," of the Standard Specifications, "Profile Index" of this section, and dowel bar alignment verification, without grinding or other corrective work.

The Engineer may waive the initial test strip if the Contractor proposes to use a batch plant mixer and paving equipment with the same personnel that were satisfactorily used on a Department project within the preceding 12 months. The personnel shall be individuals listed in the prepaving conference used on a preceding Department project.

Materials resulting from the construction and removal of rejected test strips shall become the property of the Contractor and shall be removed and 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.

MATERIALS

Concrete

Attention is directed to Section 90, "Portland Cement Concrete," of the Standard Specifications, regarding mix proportions for concrete being determined by the Contractor.

Primary aggregate gradings shall conform to the gradation requirements of Section 90-3, "Aggregate Gradings," of the Standard Specifications. When combined in the proportions determined by the Contractor, the percent passing the 9.5 mm sieve and retained on the 2.36 mm sieve shall not be less than 16 percent of the total aggregate.

The cementitious material content shall not exceed 400 kg/m³.

Tie Bars

Tie bars shall be deformed reinforcing steel bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or 420; ASTM Designation: A 615/A 615M (Grade 280 or 420), A996/A996M or A706/A706M. Tie bars shall be epoxy-coated in conformance with the requirements in ASTM Designation: A 934/A 934M or A 775/A 775M and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the epoxy-coating thickness after curing shall be between 175 to 400 micrometers (7 to 16 mils). Fabrication, sampling and jobsite handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except the 2 samples shall be 750 mm long. Epoxy-coated tie bars shall not be bent.

Epoxy (Drill and Bond)

Epoxy for bonding tie bars and dowel bars to portland cement concrete shall be a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V, Grade 3 (Non-Sagging), Class A, B or C. The class used shall be dependent on the internal temperature of the hardened concrete at the time the epoxy is to be applied. Class A shall be used when the internal temperature is below 4°C, but not lower than recommended by the manufacturer. Class B shall be used when the internal temperature is from 4°C to 15°C. Class C shall be used when the internal temperature is above 15°C, but not higher than recommended by the manufacturer. A Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished with the epoxy. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 7 days prior to the start of work. Epoxy shall be applied in conformance with the manufacturer's recommendations.

Dowel Bars

Dowel bars shall be plain round smooth, epoxy-coated steel conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, the details shown on the plans and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that the two samples required in ASTM Designation D 3963/D 3963M shall be 460 mm long. Epoxy coating of dowel bars shall conform to the provisions in ASTM Designation: A 884/A 884M, Class A, Type 1 or Type 2, except that the bend test shall not apply.

Dowel bars shall be free from burrs or other deformations detrimental to free movement of the bars in the concrete.

Bond Breaker

Dowel bars shall be lubricated with a bond breaker over the entire bar. A bond breaker application of petroleum paraffin based lubricant or white-pigmented curing compound shall be used to coat the dowel bars completely prior to placement. Oil and asphalt based bond breakers shall not be used. Paraffin based lubricant shall be Dayton Superior DSC BB-Coat or Valvoline Tectyl 506 or an approved equal. Paraffin based lubricant shall be factory applied. White pigmented curing compound shall conform to the requirements of ASTM Designation: C 309, Type 2, Class A, and shall contain 22 percent

minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax. Curing compound shall be applied in 2 separate applications, the last application not more than 8 hours prior to placement of the dowel bars. Each application of curing compound shall be applied at the approximate rate of one liter per 3.7 m².

Dowel Bar Baskets

Dowel bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring dowel bar baskets to lean concrete base, asphalt concrete base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or asphalt concrete base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or asphalt concrete base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4 mm with a minimum shank length of 120 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with dowel bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Tie Bar Baskets

Tie bar baskets shall be manufactured with a minimum welded wire gage number of MW 65. Baskets shall be either U-frame or A-frame shape. J-frame shapes shall not be used. Tie bar baskets shall be fabricated in conformance with the requirements in ASTM Designation: A 82. Welding of baskets shall conform to the requirements in AASHTO Designation: M 254. A broken weld will be a cause for rejection of the basket. Baskets shall be Class A, Type 1 epoxy-coated in conformance with the requirements in ASTM Designation: A 884/A 884M. Fabrication and job-site handling shall conform to the requirements in ASTM Designation: D 3963 and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement," of the Standard Specifications, except that sampling of epoxy-coated wire reinforcement will not be required. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished for each shipment of epoxy-coated wire reinforcement certifying that the coated bars conform to the requirements in ASTM Designation: A 884/A 884M and the provisions in Section 52-1.02B, "Epoxy-coated Bar Reinforcement," of the Standard Specifications. The Certificate of Compliance shall include the certifications specified in ASTM Designation: A 884/A 884M and a statement that the coating material has been pre-qualified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

Concrete fasteners shall be used for anchoring tie bar baskets to lean concrete base, asphalt concrete base, asphalt treated permeable base, or cement treated permeable base. Concrete fasteners shall be driven fasteners such as concrete nails, used specifically for fastening to hardened concrete, or asphalt concrete base. Concrete fasteners shall conform to the requirements of ASTM Designation: F 1667. Concrete nails used as fasteners on lean concrete base or asphalt concrete base shall have a minimum shank diameter of 4 mm with a minimum shank length of 64 mm. Concrete nails used as fasteners on asphalt treated or cement treated permeable base shall have a minimum shank diameter of 4 mm with a minimum shank length of 120 mm. Shank length shall be the distance from the point to the bottom of the nail head. Clips and washers shall be commercial quality manufactured for use with tie bar baskets. The surface of concrete fasteners, clips, and washers shall be either zinc electroplated or galvanized with a minimum coating thickness of 0.005-mm.

Reinforcement

Reinforcement shall be epoxy coated and shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications.

Silicone Joint Sealant

Low modulus silicone joint sealant shall be furnished in a one-part silicone formulation. Acid cure sealant shall not be used. The compound shall be compatible with the surface to which it is applied and shall conform to the following requirements:

| Property | Test Method | Requirement |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------|
| Tensile stress, 150% elongation, 7-day cure at 25°± 1°C and 45% to 55% R.H. ^e | ASTM D 412 (Die C) | 310 kPa max. |
| Flow at 25° ± 1°C | ASTM C 639 ^a | Shall not flow from channel |
| Extrusion Rate at 25° ± 1°C | ASTM C 603 ^b | 75-250 g/min. |
| Specific Gravity | ASTM D 792 Method A | 1.01 to 1.51 |
| Durometer Hardness, at -18°C, Shore A, cured 7 days at 25° ± 1°C | ASTM C 661 | 10 to 25 |
| Ozone and Ultraviolet Resistance, after 5000 hours | ASTM C 793 | No chalking, cracking or bond loss |
| Tack free at 25° ± 1°C and 45% to 55% R.H. ^e | ASTM C 679 | Less than 75 minutes |
| Elongation, 7 day cure at 25° ± 1°C and 45% to 55% R.H. ^e | ASTM D 412 (Die C) | 500 percent min. |
| Set to Touch, at 25° ± 1°C and 45% to 55% R.H. ^e | ASTM D 1640 | Less than 75 minutes |
| Shelf Life, from date of shipment | — | 6 months min. |
| Bond, to concrete mortar-concrete briquettes, air cured 7 days at 25° ± 1°C | AASHTO T 132 ^c | 345 kPa min. |
| Movement Capability and Adhesion, 100% extension at -18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C | ASTM C 719 ^d | No adhesive or cohesive failure after 5 cycles |

Notes:

- a. ASTM Designation: C 639 Modified (15 percent slope channel A).
- b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.
- c. Mold briquettes in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquettes shall be dried to constant mass at 100 ± 5° C.
- d. Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in conformance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5-mm.
- e. R.H. equals relative humidity.

The silicone joint sealant shall be formulated to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

A Certificate of Compliance for the silicone sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate shall also be accompanied with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

Foam Backer Rods

Foam backer rods shall be Type 1, conforming to the requirements of ASTM Designation: D 5249. Foam backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sawcut and shall be expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Hot applied sealant that will melt the foam backer rod shall not be used. The Contractor shall submit a manufacturer's data sheet verifying that the foam backer rod is compatible with the sealant to be used.

Joint Filler Material

Joint filler material shall be preformed expansion joint filler for concrete (bituminous type), conforming to the requirements of ASTM Designation: D 994.

A Certificate of Compliance for the joint filler material shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall be accompanied with a certified test report of the results of the required tests performed on the joint filler material within the previous 12 months prior to proposed use. The certificate and accompanying test report shall be provided for each lot of joint filler material prior to use on the project.

Hydraulic Cement Grout (non-shrink)

Hydraulic cement grout (non-shrink) shall conform to the requirements in ASTM Designation: C 1107. At the Contractor's option, clean, uniformly rounded aggregate filler may be used to extend the grout. The extension of grout shall not exceed 60 percent of the mass of the grout or the maximum amount of grout extension recommended by the manufacturer, whichever is less. The moisture content of the aggregate filler shall not exceed 0.5 percent. Grading of the aggregate filler shall conform to the following:

| Sieve Size | Percentage Passing |
|------------|--------------------|
| 12.5 mm | 100 |
| 9.5 mm | 85-100 |
| 4.75 mm | 10-30 |
| 2.36 mm | 0-10 |
| 1.10 mm | 0-5 |

PAVEMENT CONCRETE MIX PROPORTIONS

The Contractor shall determine the mix proportions for pavement concrete. The laboratory used to develop the mix proportions shall meet the requirements of ASTM Designation: C 1077, and shall have current AASHTO accreditation for test methods AASHTO Designation: T 97 or ASTM Designation: C 78, and AASHTO Designation: T 126 or ASTM Designation: C 192.

The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be determined in conformance with the requirements in California Test 559. Trial mixtures shall be made no more than 24 months before field qualification. The minimum cementitious materials content or the maximum water to cementitious materials ratio shall be that determined from the trial mixtures curve to produce a minimum modulus of rupture of 3.9 MPa at 28 days age and 4.5 MPa at 42 days age. To account for variances in materials, production of concrete, and modulus of rupture testing, the Contractor shall include as part of the proposed mix proportions an increase to the cementitious material content or a decrease to the water to cementitious materials ratio, determined from trial mixtures, to ensure that portland cement concrete produced during paving operations conforms to the requirements in "Modulus of Rupture," in this section.

At least 15 days prior to field qualification, the Contractor shall submit the proposed pavement concrete mix proportions with laboratory test reports. Laboratory test reports shall include modulus of rupture determined for each trial mixture at ages of 10, 21, 28 and 42 days in conformance with the applicable portions of California Test 559.

Field Qualification

Field qualification of proposed mix proportions will be required prior to placement of pavement concrete. The Contractor shall perform field qualification and submit certified test data to the Engineer. Field qualification data shall be based upon the proposed use of materials, mix proportions, mixing equipment, procedures and size of batch.

Proposed concrete mix proportions will be field qualified when the test results of five beams from a single batch of concrete indicate the average modulus of rupture is at least 3.9 MPa with no single beam lower than 3.8 MPa at an age of the Contractor's choice but not later than 28 days. Beams shall be tested for modulus of rupture at a minimum of 10, 21, and 28 days of age. Test specimens shall be made and tested in conformance with the requirements in California Test 523.

The certified field qualification test data reports shall include the following:

1. Date of mixing,
2. Mixing equipment and procedures used,
3. Volume of batch in cubic meters and the mass or volume,
4. Type and source of ingredients used,

5. Penetration and slump of the concrete,
6. The air content of the concrete, and
7. The age at time of testing and strength of concrete specimens tested.

Field qualification test data reports shall be signed by a certified representative in charge of the laboratory that performed the tests.

If the Contractor changes a source of supply or proportions, the Contractor shall submit a new proposed mix design and furnish samples from the new source, or sources, at least 60 days prior to their intended use. The new mix proportions shall be trial batched and field qualified, unless, the Engineer determines the change is not substantive. No extension of contract time will be allowed for the time required to perform the sampling, testing, preparing and qualifying new mix proportions for new aggregate sources proposed by the Contractor.

MODULUS OF RUPTURE

The Engineer will test portland cement concrete pavement for modulus of rupture in conformance with the requirements in California Test 523. Acceptance will be on a lot basis. Each lot shall not exceed 750 m³ of concrete pavement. The Engineer will determine sample locations. A minimum of six beam specimens shall be made from each sample. Beam specimens will be tested for modulus of rupture at 10, 21, and 28 days. The modulus of rupture for each lot will be calculated by averaging the results of two beams representing that lot tested at 28 days of age. The difference in modulus of rupture between each individual beam result shall not exceed 0.44-MPa.

The Contractor shall perform sampling and testing of beam specimens to determine if concrete pavement has achieved a modulus of rupture of 2.4 MPa when requesting early use of concrete pavement in conformance with the provisions in Section 90-8.03, "Protecting Concrete Pavement," of the Standard Specifications. Beam specimens shall be made and tested in conformance with the requirements in California Test 523.

INSTALLING TIE BARS

Tie bars shall be installed at longitudinal contact joints and longitudinal weakened plane joints as shown on the plans. Contiguous width of new portland cement concrete pavement tied together with tie bars shall not exceed 15 m. Tie bars shall not be installed at joints between portland cement concrete and asphalt concrete pavements.

Tie bars shall be installed at longitudinal joints by one of the following methods:

1. Drilling and bonding tie bars with two-component, epoxy-resin that conforms to this section. Drilled holes shall be cleaned in conformance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Tie bars will be rotated 180° while being inserted into the epoxy filled holes. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured as specified by the manufacturer instructions. Tie bars that are improperly placed or bonded, as determined by the Engineer, will be rejected. If rejected, new holes shall be drilled and new tie bars shall be placed and securely bonded to the concrete. Rejected tie bars shall be cut flush with the joint face. Exposed ends of tie bars shall be epoxy coated. The center of the new holes shall be offset 75 mm horizontally from the center of the rejected hole to maintain the minimum clearance to the dowel bar. Work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.
2. Inserting tie bars into the plastic slipformed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been an insertion performed. Loose tie bars shall be replaced by drilling and bonding as described in A above, at the Contractor's expense.
3. Using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and shall be accompanied with installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.
4. Using tie bar baskets that conform to these special provisions

Tie bars shall be oriented perpendicular to the pavement joint and parallel with the surface of the pavement at mid-slab depth. Tie bar alignment tolerances shall conform to the requirements for dowel bars except embedment length tolerance shall be ±50 mm.

If tie bar baskets are used, they shall be anchored to the base to hold the tie bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each basket (4 per lower runner wire). Temporary spacer wires shall be cut or removed after the baskets are anchored into position before concrete placement. Concrete pavement shall not be placed if the baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor in areas where access is restricted or other construction limitations are encountered. The Contractor shall demonstrate that the baskets are anchored and shall not shift during concrete placement. The Contractor shall provide

longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

DOWEL PLACEMENT

Dowel bars shall be centered on the joint within a tolerance of ± 50 mm in the longitudinal direction directly over the contact joint or sawcut for the transverse weakened plane joints, as shown on the plans. Prior to placement of dowel bars, the Contractor shall submit to the Engineer a written procedure to identify the transverse weakened plane joint locations relative to the middle of the dowel bars and the procedure for consolidating concrete around the dowel bars.

Dowel bars shall be placed at transverse weakened plane joints within shoulder areas except at drainage inlets.

Dowel bars shall be placed at longitudinal joints as shown on the plans.

Dowel bars shall be placed as shown on the plans by using dowel bar baskets or by mechanical insertion.

When dowel bars are placed by mechanical insertion, the concrete over the dowel bars shall be reworked and refinished so that there is no evidence on the surface of the completed pavement that there has been any insertion performed. When drill and bonding of dowel bars is performed at contact joints, a grout retention ring shall be used.

When dowel bar baskets are used, they shall be anchored to the base to hold the dowel bars at the specified depth and alignment during concrete placement without displacement. A minimum of 8 alternating, equally spaced, concrete fasteners with clips shall be used to anchor each 3.6 m dowel bar basket (4 per lower runner wire). At least 10 concrete fasteners shall be used for basket sections greater than 3.6 m and less than or equal to 4.9 m. Temporary spacer wires connecting dowel bar baskets shall be cut or removed after the dowel bar baskets are anchored into position prior to concrete placement. Paving shall be suspended when dowel bar baskets are not in place at least 60 m in advance of the concrete placement operation. The Engineer may waive this requirement upon written request by the Contractor, in areas, where access is restricted, or other construction limitations are encountered. The Contractor shall demonstrate to the Engineer's satisfaction that dowel bar baskets are adequately anchored and not shift during concrete placement. The Contractor shall provide longer concrete nails than the minimum lengths for the varying bases beneath the portland cement concrete when anchored dowel bar baskets demonstrate movement.

Full compensation for providing longer concrete nails shall be considered as included in the contract unit price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

| Dowel bar placement at transverse and longitudinal weakened plane joints | |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Horizontal offset | ± 25 mm |
| Longitudinal translation | ± 50 mm |
| Horizontal skew | 9 mm |
| Vertical skew | 9 mm |
| Vertical depth | $(d/3 + 12)$ mm from pavement surface to top of dowel bar or -15 mm below planned placement |

Note: d = pavement thickness in mm

CORE DRILLING FOR DOWEL BAR AND TIE BAR PLACEMENT ALIGNMENT ASSURANCE TESTING

Coring to confirm dowel bar and tie bar placement, alignment, and concrete consolidation shall be provided by the Contractor throughout the project, at locations determined by the Engineer. Each day's paving shall be cored within 2 days by performing a minimum of 2 and a maximum of 4 tests for dowel bar placement and position for every 1670 m² of doweled pavement or fraction thereof and one test for tie bar placement and position for every 3340 m² of pavement with tie bars. One test shall consist of drilling two cores, one on each end of a dowel bar to expose both ends and allow measurement for proper alignment. The minimum core hole diameter shall be 127 mm. If the cores indicate that dowel bars or tie bars are not within the allowable tolerances or if air voids exist surrounding the dowel bars or tie bars, additional cores will be required to determine the limits and severity of unacceptable work.

The holes shall be cored by methods that will not damage the concrete adjacent to the holes. Immediately after coring, the concrete cores shall be submitted to the Engineer for inspection, and the cores shall be identified by the Contractor with a location description.

After removal of cores, core hole voids in concrete pavement shall be cleaned and filled with hydraulic cement grout (non-shrink). After placement of hydraulic cement grout, the material while still plastic shall be finished and textured to match the adjacent pavement surface. The backfill material shall be the same level as the pavement surface.

Water for core drilling operations shall be from a local domestic water supply, and shall contain not more than 1000 parts per million of chlorides as CL, nor more than 1300 parts per million of sulfates as SO₄, nor shall it contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

Dowel bar and tie bar alignment shall be within the specified tolerances. If dowel bars or tie bars are found to be installed improperly, the paving operations shall not continue until the Contractor has demonstrated to the Engineer that the problem which caused the improper dowel bar or tie bar positioning has been corrected.

Dowel bars in rejected joints shall be replaced by the Contractor by saw cutting on each side of the rejected joint a minimum of 0.9-m, lifting out concrete to be removed, installing new dowel bars at the new transverse joints, installing dowel bars and preformed sponge rubber expansion joint filler along the longitudinal joints, placing concrete, and installing new joints. Preformed sponge rubber expansion joint filler shall conform to the requirements in ASTM Designation: D 1752. New dowel bar holes shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowels to be installed at the contact joints. Dowel bars shall be placed, as shown on the plans, for the 2 new transverse contact joints. Original exposed tie bars, located within the slab replacement area, shall be cut flush with the lane or pavement edge and dowel bars shall be installed to replace the tie bars at an offset of 75 mm, horizontally from the tie bar location. Holes for dowel bars to be placed along the longitudinal joint shall be drilled, not more than 3 mm greater than the dowel bar diameter, by the use of an automatic dowel-drilling rig for the dowel bars to be installed at the contact joints.

When requested by the Contractor and approved by the Engineer, dowel bars which are more than ± 50 mm but less than ± 75 mm from being centered directly over the sawcut for the transverse weakened plane joint, may remain in place, and the Contractor shall pay to the State the amount of \$32.30 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect dowel bar alignment or improper concrete consolidation around dowels. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect dowel bar alignment or improper concrete consolidation around dowel bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation shall be in addition to other adjustments for incorrect tie bar alignment or improper concrete consolidation around tie bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

Tie bars which are not within the specified tolerance for placement and position, as determined from inspection and measurements of cores, may remain in place when requested by the Contractor and approved by the Engineer. The Contractor shall pay to the State the amount of \$16.15 per square meter for the quantity of concrete pavement panels represented by the cores indicating incorrect tie bar alignment or improper concrete consolidation around tie bars. The quantity of concrete pavement area used to determine the amount of payment to the State will be calculated using the panel dimensions for panels adjacent to and inclusive of the joints with incorrect tie bar alignment or improper concrete consolidation around tie bars. The Department will reduce compensation from moneys due, or that may become due to the Contractor under the contract. This reduced compensation will be in addition to other adjustments for incorrect dowel bar alignment or improper concrete consolidation around dowel bars as specified in these special provisions and for pavement thickness deficiency in conformance with the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications and in addition to other adjustments for deficient Cleanness Value and coarse aggregate grading; and for deficient Sand Equivalent and fine aggregate grading in conformance with the provisions in Section 90-2.02, "Aggregate," of the Standard Specifications.

LIQUID JOINT SEALANT INSTALLATION

The joint sealant detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Weakened plane joints shall be constructed by the sawing method. Should grinding or grooving be required over or adjacent to joints after sealant has been placed, the joint materials shall be removed and 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, and replaced at the Contractor's expense. Immediately after sawing, a water wash using less than 0.7 MPa pressure shall be used to remove the slurry from the sawing operation.

Transverse weakened plane joints shall be Type B as shown on the plans. Longitudinal weakened plane joints shall be Type B as shown on the plans.

Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, the joint walls shall be cleaned by the dry sand blast method and other means as necessary to remove from the joint objectionable material such as soil, asphalt, curing compound, paint and rust. Sand blasting shall be performed in at least 2 passes, one for each side of the joint, with the nozzle held at an angle to the joint within 25 to 51 mm of the pavement. After cleaning the joint, traces of sand, dust and loose material shall be removed from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Surface moisture or

dampness shall be removed at the joints by means of compressed air or moderate hot compressed air or other means approved by the Engineer. Drying procedures that leave a residue or film on the joint wall shall not be used. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 -mm and a minimum pressure of 0.62-MPa.

Backer rods shall be installed when the temperature of the portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Backer rod shall be installed when the joints to be sealed have been properly patched, cleaned and dried, as determined by the Engineer. Methods of placing backer rod that leave a residue or film on joint walls shall not be used.

Immediately after placement of the backer rod, joint sealant shall be placed in the clean, dry, prepared joints as shown on the plans. The joint sealant shall be applied using a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Adequate pressure shall be applied to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant, the surface of the sealant shall be recessed as shown on the plans.

Failure of the joint material in either adhesion or cohesion will be cause for rejection of the joint. The finished surface of joint sealant shall conform to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans, as determined by the Engineer, shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.

After each joint is sealed, surplus joint sealer on the pavement surface shall be removed. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

Longitudinal seals shall be installed before installing transverse seals. Longitudinal seals shall be continuous except at intersections with transverse seals. Transverse seals shall be installed in one continuous piece throughout each transverse joint. After the longitudinal seal is completed and the transverse seal is ready to be installed, a single cut with a sharp instrument or saw shall be made across the longitudinal seal at the middle of the intersection with the transverse seal. After the initial cut of the longitudinal seal, if the longitudinal joint material does not relax enough to allow proper installation of the transverse seal, the longitudinal joint material shall be trimmed precisely to accommodate the transverse seal and form a tight seal between the 2 joints.

An installation machine specifically designed for the installation of preformed compression joint seals shall be used to install the seal at the specified depth without cutting, nicking, or twisting the seal. The installation machine shall install the seal with no more than 4 percent stretch in the installed seal. Hand installation methods of installing seals will not be permitted.

The percentage of stretch shall be determined by laying a length of the preformed compression joint seal material cut to the exact length of the pavement joint to be sealed. The length shall then be measured. The cut length of preformed compression joint seal material shall then be installed in the joint. Excess amount of seal material remaining at the end of the joint shall be measured as the amount of stretch. The measured amount of stretch shall be divided by the original measured length to determine the percentage of stretch.

The completed seal shall not be twisted or have deformities that prevent the seal from making complete continuous contact with the joint walls. Seals installed that are twisted or deformed, or do not make continuous contact with joint walls or with greater than 4 percent stretch of the joint material will be rejected and removed.

CONSTRUCTING TRANSVERSE CONTACT JOINTS

A transverse contact (construction) joint shall be constructed, including dowel bars, at the end of each day's work or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.

If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of excess concrete shall be at the Contractor's expense. Excess 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.

A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of dowel bars.

CONSTRUCTING LONGITUDINAL ISOLATION JOINTS

Final alignment of perpendicular transverse weakened plane joints in pavement shall not be made to match the spacing or skew of the weakened plane joints in the existing parallel concrete pavement. Tie bars shall not be placed across longitudinal isolation joints. The edge of the existing pavement shall be saw cut a width 3 mm and to the full depth of the existing concrete pavement to produce a flat vertical face. Prior to placing concrete, joint filler material shall be placed as shown on the plans. The joint filler shall be secured to the face of the existing pavement joint face by a method that will hold the joint filler in place and prevent the new concrete from adhering to the existing concrete, during placement of concrete.

Sealant for longitudinal isolation joints shall be silicon and placed in conformance with the requirements for liquid joint sealant installation as specified above, except references to backer rods shall not apply.

CONSTRUCTING TRANSVERSE JOINT CONNECTIONS AND ANCHORS

Concrete pavement joints at transitions to asphalt concrete pavement, pavement end anchors and bridge approach slabs shall conform to the details as shown on the plans. Paint binder shall be applied to the concrete surface that asphalt concrete pavement will contact. Paint binder shall be applied in conformance with the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications.

PROFILE INDEX

The pavement surface shall be profiled, by the Contractor not more than 10 days following concrete placement, in the presence of the Engineer, using a California Profilograph or equivalent in conformance with the requirements in California Test 526, except a blanking band of zero (null) shall be used to determine the Profile Index. Two profiles shall be made within each traffic lane, one meter from and parallel with each lane line.

Profiled pavement shall conform to the following Profile Index requirements:

- A. Pavement on tangent alignment and pavement on horizontal curves having a centerline radius of curve 600 m or more shall have a Profile Index of 64 mm or less for each 0.1-km.
- B. Pavement on horizontal curves having a centerline radius of curve 300 m or more but less than 600 m and pavement within the superelevation transition of those curves shall have a Profile Index of 128 mm or less for each 0.1-km.

Individual high points in excess of 7.5 mm, as determined by measurements of the profilogram in conformance with the requirements in California Test 526, except using a blanking band of zero (null), shall be reduced by grinding in conformance with the requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications until the high points as indicated by reruns of the profilograph do not exceed 7.5 mm.

Pavement grinding shall not be performed before 10 days have elapsed after concrete placement, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa.

CONSTRUCTING WEAKENED PLANE JOINTS (EARLY ENTRY SAW METHOD)

The Contractor may construct weakened plane joints using lighter weight concrete saws (early entry saws) specifically designed for sawing fresh concrete without the use of water. The early entry saws shall be capable of sawing joints within 2 hours of cure time after placement of the concrete pavement without ravelling or tearing, as defined in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications. Joints sawed with early entry saws that develop random cracking shall be removed to the nearest controlled joint and replaced with concrete pavement containing dowel bars and tie bars in conformance with these special provisions and as shown on the plans. The removal and replacement work shall be at the Contractor's expense. Weakened plane joints not sawed within 2 hours of placing concrete pavement shall be sawed by conventional power driven wet-type concrete saws in conformance with the requirements of Section 40-1.08B(1), "Sawing Method," of the Standard Specifications.

Sawed grooves shall be cut to a maximum of 3 mm in width for longitudinal and transverse weakened plane joints made with early entry saws. The minimum depth of cut shall be calculated utilizing the formula in Section 40-1.08B(1), "Sawing Method," of the Standard Specifications except $d = t/4$.

TIE BARS ALONG LONGITUDINAL JOINT FOR SHORT RADIUS CURVES

When paving along short radius curves, the transverse joints shall be maintained in a single continuous straight line across lanes, through the radius point. Tie bars shall maintain minimum clearance from the transverse joint as shown on the plans. If the inside or outside curve of the panel does not allow equal uniform spacing of tie bars at 710 mm between tie bars, then the tie bars shall be equally spaced so that a minimum spacing of 375 mm to a maximum spacing of 710 mm is maintained between tie bars. Additional tie bars shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If dowel bars are specified along longitudinal joint for short radius curves, then dowel bars shall conform to the requirements of this special provision for tie bars spacing and tolerance.

MEASUREMENT AND PAYMENT

Sealing longitudinal and transverse weakened plane joints, and longitudinal isolation joints in portland cement concrete pavement will be measured by the meter. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the sealed pavement joints will be measured and paid for as seal pavement joint.

The contract price paid per meter for seal pavement joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing pavement joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing backer rod, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, 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 meter for seal longitudinal isolation joint shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in sealing longitudinal isolation joints complete in place, including sawing, cleaning and preparing the joints in the concrete pavement, furnishing and installing joint filler material, repairing and patching spalled or raveled sawed joints, and replacing or repairing rejected joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Concrete pavement will be measured by the cubic meter in conformance with the provisions in Section 40-1.13, "Measurement," of the Standard Specifications. No deduction will be made for the volume of epoxy-coated dowel bars, epoxy-coated tie bars and, when used, tie bar baskets with fasteners and dowel bar baskets with fasteners, in the concrete pavement. When a test strip conforms to the specifications for concrete pavement and remains a part of the project paving surface, the concrete will be measured and paid for as concrete pavement.

The contract price paid per cubic meter for concrete pavement shall include full compensation for furnishing all labor, materials (including cementitious material in the amount determined by the Contractor), tools, equipment, and incidentals, and for doing all the work involved in constructing the portland cement concrete pavement complete in place, including furnishing and placing epoxy-coated dowel bars, epoxy-coated tie bars and, when used, any tie bar baskets and dowel bar baskets with fasteners, submittal to the Engineer all test data for determination of mix proportions of concrete for concrete pavement and for providing the facility, Contractor personnel and all the work involved in arranging and holding the prepping conference, for constructing and repairing all joints; for performing all profile checks for Profile Index and furnishing final profilograms to the Engineer; for grooving and grinding required for final finishing; and for removing, and replacing pavement for deficient thickness, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for drilling holes and bonding tie bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for coring test strips for evaluation by the Engineer and for back-filling core holes with hydraulic cement grout when the test strip remains in place as part of the concrete pavement; and for constructing, coring and removing and disposing of test strips that are rejected shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for core drilling for dowel bar alignment and backfilling with hydraulic cement grout shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars are out of alignment tolerances and the Engineer orders additional dowel bar or tie bar coring, full compensation for drilling the additional cores shall be considered as included in the contract price per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

If the initial cores show that dowel bars are within alignment tolerances and the Engineer orders more dowel bar coring the additional cores will be paid for as extra work in conformance with the provisions in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Full compensation for drilling holes and bonding dowel bars with epoxy resin shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing epoxy coated reinforcement for transition end panel shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

Full compensation for furnishing and placing paint binder (tack coat) for transition end panel shall be considered as included in the contract price paid per cubic meter for concrete pavement and no additional compensation will be allowed therefor.

10-1.56 REPAIR SPALLED JOINTS

This work shall consist of removing unsound or damaged concrete from spalled areas at transverse or longitudinal joints shown on the plans and filling the area with a fast-setting patching grout in conformance with these special provisions.

MATERIALS

Fast-Setting Grout

Fast-setting grout shall be, at the option of the Contractor, any of the following:

1. Either of the following magnesium phosphate grouts:

- 1.1. Single component water activated, or
- 1.2. Dual component with a prepackaged liquid activator
2. Modified high alumina based grout, or
3. Hydraulic cement based grout.

The Contractor may use accelerating admixtures conforming to the requirements in ASTM Designation: C 494, Type C and to the provisions in Section 90-4, "Admixtures," of the Standard Specifications, except that the chloride content of the accelerating admixture shall be less than one percent by mass. Fast-setting grout 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. |
| Flexural 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 mass, % | California Test 442 | 0.05 max. |
| Water Soluble Sulfates* by mass, % | California Test 417 | 0.25 max. |

* Test to be a cube specimen, fabricated in conformance with the requirements in ASTM Designation: C 109, cured at least 14 days and then pulverized to 100% passing the 300 µm sieve.

Clean, uniformly rounded aggregate filler may be used to extend the prepackaged grout. The moisture content of the aggregate filler shall not exceed 0.5-percent by mass. Grading of the aggregate filler shall conform to the following:

| Sieve Size | Percentage Passing |
|------------|--------------------|
| 6.5 mm | 100 |
| 1.18 mm | 0-5 |

The amount of aggregate filler shall conform to the fast-setting grout manufacturer's recommendation, but in no case shall the amount of aggregate filler exceed 50 percent of the volume of the grout mix.

Fast-setting grout shall be formulated for a minimum initial set time of 15 minutes and a minimum final set time of 25 minutes at 21°C. The materials, prior to use, shall be stored in a cool, dry environment.

Mix water used with water activated material shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, nor more than 1500 parts per million of sulfates as SO₄.

Water for curing shall not contain impurities in sufficient amounts to cause discoloration of the concrete surface or produce etching of the surface.

The quantity of water or liquid activator to be blended with the dry component for magnesium phosphate grout shall conform to the limits recommended by the manufacturer.

Addition of retarders, when needed, shall conform to the fast-setting grout manufacturer's recommendations.

Silicone Joint Sealant

Silicone joint sealant shall be low modulus and shall be furnished in a one-part silicone formulation. Acid cure sealants shall not be used. The Contractor shall use the same brand of silicone joint sealant throughout the project. The silicone joint sealant shall conform to the following requirements:

| Property | Test Method | Requirement |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------|
| Tensile stress, 150% elongation,
7-day cure at 25°C±1°C and 45% to 55% R.H. ^e | ASTM Designation:
D 412 (Die C) | 310 kPa max. |
| Flow at 25°C ±1°C | ASTM Designation:
C 639 ^a | Shall not flow from channel |
| Extrusion Rate at 25°C ±1°C | ASTM Designation:
C 603 ^b | 75-250 g/min |
| Specific Gravity | ASTM Designation:
D 792 Method A | 1.01 to 1.51 |
| Durometer Hardness, at -18°C,
Shore A, cured 7 days at 25°C ±1°C | ASTM Designation:
C 661 | 10 to 25 |
| Ozone and Ultraviolet Resistance,
After 5000 hours | ASTM Designation:
C 793 | No chalking, cracking or bond loss |
| Tack free at 25°C ±1°C and 45% to 55% R.H. ^e | ASTM Designation:
C 679 | Less than 75 minutes |
| Elongation, 7 day cure
at 25°C ±1°C and 45% to 55% R.H. ^e | ASTM Designation:
D 412 (Die C) | 500 percent min. |
| Set to Touch, at 25°C ±1°C and 45% to 55%
R.H. ^e | ASTM Designation:
D 1640 | Less than 75 minutes |
| Shelf Life, from date of shipment | — | 6 months min. |
| Bond, to concrete mortar-concrete briquets,
air cured 7 days at 25° ± 1°C | AASHTO Designation:
T 132 ^c | 345 kPa min. |
| Movement Capability and Adhesion,
100% extension at -18°C after,
air cured 7 days at 25°C ±1°C,
and followed by 7 days in water at 25°C ±1°C | ASTM Designation:
C 719 ^d | No adhesive or cohesive failure after 5 cycles |

Notes:

- a. ASTM Designation: C 639 Modified (15 percent slope channel A).
- b. ASTM Designation: C 603, through 3-mm opening at 345 kPa.
- c. Mold briquets in conformance with AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with AASHTO Designation: T 132. Briquets shall be dried to constant mass at 100 C ±5° C.
- d. Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in accordance with ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5 mm.
- e. R.H. equals relative humidity.

Silicone joint sealant shall be formulated to cure after application on grades up to 15 percent.

A Certificate of Compliance for silicone joint sealant shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate shall be accompanied with a certified test report of the results for the required tests performed on the sealant material within the previous 12 months prior to proposed use. The Certificate and accompanying test report shall be provided for each lot of silicone joint sealant prior to use on the project.

Backer Rods

Backer rods shall have a diameter prior to placement at least 25 percent greater than the width of the sealant reservoir and shall be expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. The Contractor shall submit a manufacturer's data sheet verifying that the backer rod is compatible with the sealant to be used.

Joint Bond Breaker

Joint bond breaker material shall be either corrugated cardboard with a 0.15-mm polyethylene covering or expanded polystyrene material.

Bonding Agent

Bonding agent shall be as recommended by the fast-setting grout manufacturer.

SPALL REPAIR PROCEDURE

Concrete Removal

Outlines of rectangular areas, as marked by the Engineer, shall be cut with a diamond bladed saw to a minimum depth of 50 mm. Unsound and damaged concrete between the saw cut and the joint, and to the depth of the saw cut, shall be removed by methods that will not damage the concrete pavement that is to remain in place. Damage to the concrete pavement beyond the limits to be removed shall be repaired at the Contractor's expense. A pneumatic hammer greater than 7 kg shall not be used for removal of concrete.

Concrete pavement removed to repair spalled joints shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way," of the Standard Specifications.

Cleaning

After the repair area has been cleared of unsound concrete, the exposed faces of the concrete shall be thoroughly cleaned. Cleaning shall be by abrasive blasting, either sand blasting or high pressure water blasting. Water blasting equipment for concrete cleaning shall be capable of producing a blast pressure of 20 MPa to 40 MPa.

After abrasive blasting, the exposed concrete area shall be cleaned with moisture-free, oil-free compressed air to remove debris. Air compressors shall deliver air at a minimum of 3.4 m³ per minute and develop 0.63-MPa of nozzle pressure.

Joint Bond Breaker Installation

A joint bond breaker shall be placed along the joint, and extend 25 mm beyond the edges of the patch. Joint bond breaker shall be the same width as the existing joint.

Bonding Agent Application

Bonding agent shall be mixed on site in small quantities and mixed in conformance with the manufacturer's instructions. Bonding agent shall be applied in a thin, even coat by using a stiff bristle brush scrubbing the entire area including the patch walls.

Mixing Fast-Setting Grout

Fast-setting grout shall be mixed in a small mobile drum or paddle mixer in conformance with the manufacturer's instructions and these special provisions.

The components of prepackaged, dual component magnesium phosphate grout with a prepackaged liquid activator shall be as supplied by the manufacturer. Portions of components shall not be used. Water shall not be added to dual component magnesium phosphate grout.

Magnesium phosphate grout shall not be mixed in containers or worked with tools containing zinc, cadmium, aluminum, or copper. Modified high alumina based grout shall not be mixed in containers or worked with tools containing aluminum.

Placement of Fast-Setting Grout

Magnesium phosphate grout shall be placed on a dry surface. The grout shall air cure with no curing medium applied. The repaired area shall be protected from public traffic for at least 2 hours after the grout sets.

High alumina based grout and hydraulic cement based grout may be placed on either a dry or damp surface, in conformance with the manufacturer's instructions. Curing shall be in conformance with the manufacturer's instructions. When curing compound is recommended by the manufacturer, either curing compound (1) or (2) that conforms to Section 90-7.01B, "Curing Compound Method," of the Standard Specifications may be used. The repaired area shall be protected from public traffic for at least 2 hours after the grout sets.

Resealing Joints

Existing joints where sealant was removed shall be cleaned, resealed and recessed below the final surface as shown on the plans in conformance with the joint sealant manufacturer's instructions and these special provisions.

MEASUREMENT AND PAYMENT

Repair spalled joints will be measured by the square meter of the pavement surface area repaired.

The contract price paid per square meter for repair spalled joints shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in repairing spalled joints, including removal and disposal of portions of concrete pavement involved in repairing spalled joints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.57 GRIND EXISTING CONCRETE PAVEMENT

This work shall consist of grinding existing portland cement concrete as shown on the plans, as specified in Section 42-2, "Grinding," of the Standard Specifications and these special provisions, and as directed by the Engineer.

Grinding equipment for grinding concrete pavements shall use diamond blades mounted on a self-propelled machine designed for grinding and texturing concrete pavements. Grinding equipment that causes raveling, aggregate fracturing, or spalling, or that damages the transverse or longitudinal joints shall not be used.

Grinding shall be performed in the longitudinal direction of the traveled way and shall be done full lane width so that the grinding begins and ends at lines perpendicular to the pavement centerline.

Grinding concrete pavement shall result in a parallel corduroy texture consisting of grooves 2 mm to 3 mm wide with 183 to 193 grooves per meter width of grinding. Tops of ridges shall be between 1.5 mm and 2.0 mm from the bottom of the blade grooves.

The ground surface at transverse joints or cracks will be tested with a 3.6 m \pm 0.06-m long straightedge laid on the pavement parallel with the centerline with its midpoint at the joint or crack. The surface shall not vary by more than 2 mm from the lower edge of the straightedge.

Cross-slope uniformity and positive drainage shall be maintained across the entire traveled way and shoulder. The cross-slope shall be uniform so that when tested with a 3.6 m \pm 0.06-m long straightedge placed perpendicular to the centerline, the ground pavement surface shall not vary more than 6 mm from the lower edge of the straightedge.

After grinding has been completed, the pavement surface shall be profiled in conformance with the requirements of Section 40-1.10, "Final Finishing," of the Standard Specifications. Two profiles shall be obtained in each lane approximately one meter from the lane lines. The average profile index shall be determined by averaging the two profiles in each lane. Additional grinding shall be performed, where necessary, to bring the ground pavement surface within the Profile Index requirements specified in Section 40-1.10, "Final Finishing," of the Standard Specifications.

Full compensation for profiling the ground pavement surface with a California profilograph or equivalent and any necessary additional grinding to bring the finished surface within the specified tolerances and for furnishing final profilograms to the Engineer shall be considered as included in the contract price paid per square meter for grind existing concrete pavement and no additional compensation will be allowed therefor.

The Contractor shall provide, while performing profilograph and straightedge operations, a shadow vehicle. The shadow vehicle shall consist of a truck mounted crash cushion conforming to "Traffic Control System for Lane Closure" elsewhere in these special provisions. The shadow vehicle shall operate within a stationary lane closure. The shadow vehicle shall maintain a 23 to 25 meter distance from the profilograph or straightedge operation at all times.

Full compensation for shadow vehicle shall be considered as included in the contract price paid per square meter for grind existing concrete pavement and no additional compensation will be allowed therefor.

10-1.58 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.

The Contractor may store PCC grooving or grinding residues temporarily at an offsite location in accordance with Section 7-1.13, "Disposal of Material Outside of the Right of Way," of the Standard Specifications if the Contractor has obtained approval from the California Regional Water Quality Control Board having jurisdiction over the site. Temporary storage of PCC grooving and grinding residue will not be allowed within the highway right of way. 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:

1. 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.
2. 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:

1. The name, address, and telephone number of the disposal facility.
2. If the facility is not listed above:
 - A. Copy of the facility's RWQCB or other applicable agency permit, or
 - B. RWQCB's or other applicable agency's approval, or
 - C. 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 any temporary sites located outside the right of way and disposal at the time of bidding. Costs related to obtaining approval for temporary storage and disposal within the State of California from the RWQCB or other applicable agency, or the applicable agency if the temporary disposal or disposal location is located outside of the State of California, shall be borne by the Contractor and no additional payment shall be made therefor. 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 therefor.

10-1.59 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.

Attention is directed to "Welding" of these special provisions.

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole 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.

Cast-in-drilled-hole concrete piles 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation.

Concrete deposited under slurry shall contain not less than 400 kg of cementitious material per cubic meter.

The combined aggregate grading used in concrete for cast-in-drilled-hole concrete piling shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3 "Aggregate Gradings," of the Standard Specifications.

Mineral Slurry

Mineral slurry shall be mixed and thoroughly hydrated in slurry tanks, and slurry shall be sampled from the slurry tanks and tested before placement in the drilled hole.

Slurry shall be recirculated or continuously agitated in the drilled hole to maintain the specified properties.

Recirculation shall include removal of drill cuttings from the slurry before discharging the slurry back into the drilled hole. When recirculation is used, the slurry shall be sampled and tested at least every 2 hours after beginning its use until tests show that the samples taken from the slurry tank and from near the bottom of the hole have consistent specified properties. Subsequently, slurry shall be sampled at least twice per shift as long as the specified properties remain consistent.

Slurry that is not recirculated in the drilled hole shall be sampled and tested at least every 2 hours after beginning its use. The slurry shall be sampled mid-height and near the bottom of the hole. Slurry shall be recirculated when tests show that the samples taken from mid-height and near the bottom of the hole do not have consistent specified properties.

Slurry shall also be sampled and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Samples shall be taken from mid-height and near the bottom of the hole. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken from mid-height and near the bottom of the hole have consistent specified properties.

Mineral slurry shall be tested for conformance to the requirements shown in the following table:

| MINERAL SLURRY | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------------------|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³)
- before placement in the drilled hole
- during drilling
- prior to final cleaning
- immediately prior to placing concrete | 1030* to 1110*

1030* to 1200* | Mud Weight (Density)
API 13B-1
Section 1 |
| Viscosity (seconds/liter)
bentonite
attapulgite | 29 to 53

29 to 42 | Marsh Funnel and Cup
API 13B-1
Section 2.2 |
| pH | 8 to 10.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)
- prior to final cleaning
- immediately prior to placing concrete | less than or equal to 4.0 | Sand
API 13B-1
Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ .
Slurry temperature shall be at least 4°C when tested. | | |

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

Synthetic Slurry

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

| PRODUCT | MANUFACTURER |
|-----------------|--------------------------------------------------------------------------------------------------------------------|
| SlurryPro CDP | KB Technologies Ltd.
3648 FM 1960 West
Suite 107
Houston, TX 77068
(800) 525-5237 |
| Super Mud | PDS Company
c/o Champion Equipment Company
8140 East Rosecrans Ave.
Paramount, CA 90723
(562) 634-8180 |
| Shore Pac GCV | CETCO Drilling Products Group
1350 West Shure Drive
Arlington Heights, IL 60004
(847) 392-5800 |
| Novagel Polymer | Geo-Tech Drilling Fluids
220 N. Zapata Hwy, Suite 11A
Laredo, TX 78043
(210) 587-4758 |

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001.

Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the drilled hole. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning and immediately prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| SLURRYPRO CDP
KB Technologies Ltd. | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³)
- during drilling

- prior to final cleaning
- just prior to placing concrete | less than or equal to 1075*

less than or equal to 1025* | Mud Weight (Density)
API 13B-1
Section 1 |
| Viscosity (seconds/liter)
- during drilling

-prior to final cleaning
- just prior to placing concrete | 53 to 127

less than or equal to 74 | Marsh Funnel and Cup
API 13B-1
Section 2.2 |
| pH | 6 to 11.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)
- prior to final cleaning
- just prior to placing concrete | less than or equal to 0.5 | Sand
API 13B-1
Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ .
Slurry temperature shall be at least 4°C when tested. | | |

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| SUPER MUD
PDS Company | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³)
- prior to final cleaning
- just prior to placing concrete | less than or equal to 1025* | Mud Weight (Density)
API 13B-1
Section 1 |
| Viscosity (seconds/liter)
- during drilling

- prior to final cleaning
- just prior to placing concrete | 34 to 64

less than or equal to 64 | Marsh Funnel and Cup
API 13B-1
Section 2.2 |
| pH | 8 to 10.0 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)
- prior to final cleaning
-just prior to placing concrete | less than or equal to 0.5 | Sand
API 13B-1
Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ .
Slurry temperature shall be at least 4°C when tested. | | |

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| Shore Pac GCV
CETCO Drilling Products Group | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³)
- prior to final cleaning
- just prior to placing concrete | less than or equal to 1025* | Mud Weight (Density)
API 13B-1
Section 1 |
| Viscosity (seconds/liter)
- during drilling

- prior to final cleaning
- just prior to placing concrete | 35 to 78

less than or equal to 60 | Marsh Funnel and Cup
API 13B-1
Section 2.2 |
| pH | 8.0 to 11.0 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)
- prior to final cleaning
-just prior to placing concrete | less than or equal to 0.5 | Sand
API 13B-1
Section 5 |
| *When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ .
Slurry temperature shall be at least 4°C when tested. | | |

Novagel Polymer synthetic slurries shall be tested for conformance to the requirements shown in the following table:

| NOVAGEL POLYMER
Geo-Tech Drilling Fluids | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³)
- during drilling

- prior to final cleaning
- just prior to placing concrete | less than or equal to 1075*

less than or equal to 1025* | Mud Weight (Density)
API 13B-1
Section 1 |
| Viscosity (seconds/liter)
- during drilling

- prior to final cleaning
- just prior to placing concrete | 48 to 110

less than or equal to 110 | Marsh Funnel and Cup
API 13B-1
Section 2.2 |
| pH | 6.0 to 11.5 | Glass Electrode pH Meter or pH Paper |
| Sand Content (percent)
- prior to final cleaning
-just prior to placing concrete | less than or equal to 0.5 | Sand
API 13B-1
Section 5 |
| <p>*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m³.
Slurry temperature shall be at least 4°C when tested.</p> | | |

Water Slurry

At the option of the Contractor, water may be used as slurry when casing is used for the entire length of the drilled hole. Water slurry shall be tested for conformance to the requirements shown in the following table:

| WATER SLURRY | | |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------|
| PROPERTY | REQUIREMENT | TEST |
| Density (kg/m ³)
- prior to final cleaning
- just prior to placing concrete | 1017 * | Mud Weight (Density)
API 13B-1
Section 1 |
| Sand Content (percent)
- prior to final cleaning
-just prior to placing concrete | less than or equal to 0.5 | Sand
API 13B-1
Section 5 |
| *When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m ³ . | | |

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete descriptions, details, and supporting calculations as listed below:

A. Requirements for all cast-in-drilled hole concrete piling:

1. Concrete mix design, certified test data, and trial batch reports.
2. Drilling or coring methods and equipment.
3. Proposed method for casing installation and removal when necessary.
4. Plan view drawing of pile showing reinforcement and inspection pipes, if required.
5. Methods for placing, positioning, and supporting bar reinforcement.
6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.
8. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

B. Additional requirements when concrete is placed under slurry:

1. Concrete batching, delivery, and placing systems, including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
2. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
4. Slurry testing equipment and procedures.
5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
6. Methods and equipment for slurry agitating, recirculating, and cleaning.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a test batch. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of test batch concrete under slurry will not be required. In addition to meeting the specified nominal penetration, the test batch shall meet the following requirements:

- A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after twice that time has elapsed.
- B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. Penetration tests shall be performed in conformance with the requirements in California Test 533. Slump tests shall be performed in conformance with the requirements in ASTM Designation: C 143. Upon completion of testing, the concrete 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.

The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

- A. A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps.
- B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained within 300 mm of the top of the drilled hole.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Material resulting from using slurry 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.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all cast-in-drilled-hole concrete piles that are 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control ground water.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipes with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75 mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. When the vertical reinforcement is not bundled and each bar is not more than 26 mm in diameter, inspection pipes may be placed 50 mm clear of the vertical reinforcement. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610 mm long through the complete length of pipe. If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a 32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 150 mm inside the reinforcement. Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved, identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 3 weeks for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 4 weeks if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests 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 inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractor's expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile.

If the Engineer determines that a rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the State, \$400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the State for any such pile be less than \$400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

- A. The designation and location of the pile addressed by the mitigation plan.
- B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
- C. A step by step description of the mitigation work to be performed, including drawings if necessary.
- D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
- E. Methods for preservation or restoration of existing earthen materials.
- F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
- G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
- H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
- I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. An assessment of the nature and size of the anomalies in the rejected pile.
- B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. The proposed location and size of additional piling.
- B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling.

The Contractor shall allow the Engineer 3 weeks to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, 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 pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the

Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

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 any changes in the cost of constructing cast-in-drilled-hole concrete piling with increased diameters as provided in these special provisions, including the increased quantity of portland cement concrete and any changes in the drilling cost, shall be considered as included in the contract price paid per meter for the size of cast-in-drilled-hole concrete piling shown on the plans, and no separate payment will be made therefor.

Full compensation for slurry, depositing concrete under slurry, test batches, inspection pipes, filling inspection holes and pipes with grout, drilling oversized cast-in-drilled-hole concrete piling, filling cave-ins and oversized piles with concrete, and re-drilling through concrete, shall be considered as included in the contract prices paid per meter for cast-in-drilled-hole concrete piling of the types and sizes listed in the Engineer's Estimate, and no additional compensation will be allowed therefor.

10-1.60 PRESTRESSING CONCRETE

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications.

10-1.61 TIEBACK ANCHORS

Anchors at the retaining walls, consisting of holes drilled in foundation material, grouted steel bars or strands, and anchorage assemblies, and testing of installed anchors shall conform to the details shown on the plans, the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications, and these special provisions.

Difficult tieback installation is anticipated at Retaining Walls ML 197R (Br. No. 57E0045) and ML 219L (Br. No. 57E0046) due to the presence of caving soils, low overhead clearance, existing foundation piles, and traffic control.

Difficult tieback installation is anticipated at Retaining Wall ML 239R (Br. No. 57E0059) due to the presence of caving soils, cobbles (up to 300 mm diameter) and boulders (up to 600 mm diameter), low overhead clearance, and stage construction requirements. Rotary air percussion drilling techniques may be required to install tiebacks.

The Contractor shall determine the bond length necessary to meet acceptance criteria specified herein.

The submittal of reduced prints of corrected original tracings will not be required for tieback anchor installations.

In fabricating, handling, shipping, and placing tieback anchors, adequate care shall be taken to avoid damage to the sheathing. Damage to the sheathing caused by handling and fabrication prior to tieback anchor installation shall be repaired or replaced as determined by the Engineer. Repair procedure for the sheathing shall be included in the working drawings.

The Contractor may submit, for approval by the Engineer and in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, calculations and details for furnishing an alternative number of tiebacks that provide the same horizontal component and distribution of the design force as provided by the planned tiebacks. Alternative wall details shall be furnished, for approval by the Engineer, if the number of tiebacks is reduced. Alternative design calculations and details shall be signed by an engineer who is licensed as a Civil Engineer in the State of California.

MATERIALS

Whenever "member" is referred to in Section 50, "Prestressing Concrete," of the Standard Specifications, it shall be considered to mean tieback anchor.

Structural steel for the tieback retaining wall shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions. Structural steel shall consist of the anchorage assembly. The anchorage assembly shall be galvanized as indicated on the plans. The provisions of "Welding Quality Control" of these special provisions shall not apply to the weld between the steel tube and the bearing plate of the anchorage assembly for tiebacks. Those provisions shall apply to all other welds of structural steel for tieback retaining walls.

The permanent bearing plate of the tieback anchor shall effectively distribute the design force (T) to the concrete, such that the concrete bearing stress does not exceed 11 MPa and the bending stress does not exceed $0.55 f_y$ for steel nor $0.36 f_y$ for cast steel or cast iron.

Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. Fine aggregate may be added to the grout mixture of portland cement and water used outside of the grouted sheathing in drilled holes which are 200 mm or greater in diameter, but only to the extent that the cement content of the grout is not less than

500 kg per cubic meter of grout. Fine aggregate, if used, shall conform to the provisions in Section 90-2, "Materials," and Section 90-3, "Aggregate Gradings," of the Standard Specifications.

The plastic sheathing for tieback anchors shall conform to one of the following: polyvinyl chloride (PVC) sheathing, high density polyethylene (HDPE) sheathing, or polypropylene sheathing.

Corrugated plastic sheathing shall be PVC or HDPE. The width of corrugations, the distance between corrugations, and the height of corrugations of corrugated plastic sheathing shall be approximately the same.

PVC sheathing may be used for corrugated sheathing and smooth sheathing for bar tendons. PVC sheathing shall conform to ASTM Designation: D 1784, Class 13464-B. Corrugated PVC sheathing shall have a nominal wall thickness of 1.0 mm. HDPE sheathing may be used for corrugated sheathing and smooth sheathing for bar tendons. HDPE sheathing shall have a density between 940 kg/m^3 and 960 kg/m^3 as measured in accordance with ASTM Designation: D 792, A-2. Corrugated HDPE sheathing shall have a nominal wall thickness of 1.5 mm for sheathing with an outside diameter of 75 mm or greater, and a nominal thickness of 1.0 mm for sheathing with an outside diameter less than 75 mm, with a tolerance of minus 0.25-mm.

HDPE sheathing may be used for the smooth sheathing encapsulating individual strands of strand type tendons. Smooth HDPE sheathing for encapsulating strands shall have a minimum wall thickness of 1.0 mm. Polypropylene sheathing may be used for the smooth plastic sheathing encapsulating individual strands of strand type tendons. Polypropylene sheathing shall have a density between 900 kg/m^3 and 910 kg/m^3 . Smooth polypropylene sheathing shall have a minimum wall thickness of 1.0 mm.

The smooth sheathing for the unbonded length of the individual strands shall have sufficient strength to prevent damage during construction operations and shall be watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel, or corrosion inhibiting grease. Smooth plastic sheathing, including joints, shall be watertight.

The corrugated sheathing, including joints, shall have sufficient strength to prevent damage during construction operations and shall be grout-tight and watertight, chemically stable without embrittlement or softening, and nonreactive with concrete, steel, or corrosion inhibiting grease.

The transition between the corrugated plastic sheathing and the anchorage assembly shall be an approved detail that allows stressing to the design force without evidence of distress in the corrugated plastic sheathing.

Additional requirements for tiebacks with strand type tendons are as follows:

- A. The individual strands of a tendon, except for the bonded length, shall be fully coated with corrosion inhibiting grease and then encapsulated by a smooth HDPE or polypropylene sheath. The corrosion inhibiting grease shall fill all space between strand wires and shall encapsulate the strand giving an encasement diameter at least 0.12-mm greater than the diameter of the bare strand. The sheath shall be hot melt extruded onto the strand or shall be shop applied by an approved method that assures that all spaces between the sheath and the strand and between the strand wires are filled with corrosion inhibiting grease.
- B. The corrosion inhibiting grease shall provide a continuous nonbrittle film of corrosion protection to the prestressing steel and lubrication between the strand and the sheathing, shall resist flow from the sheathing, shall be chemically stable and nonreactive with the prestressing steel, sheathing material, and concrete, and shall be organic with appropriate polar, moisture displacing, and corrosion inhibiting additives.
- C. The corrosion inhibiting grease shall have the physical properties listed in Table 3.2.1 of the Post Tensioning Manual, Fourth Edition, by the Post Tensioning Institute and as modified below. At least 40 days before use, a sample from the lot to be used and test results shall be provided for the corrosion inhibiting grease.

| Test | Requirements | ASTM Designation: |
|---------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------|
| Water Soluble Ions:
Nitrates | 10 ppm max. | D 3867 |
| Corrosion Test:
5% Salt Fog @ 38° C.
125 µm coating on
76 mm x 152 mm Q panel
Type S, 1000 hrs min. | Grade 7 or better | B 117, D 610 |
| Compatibility with sheathing:
Hardness change & volume change of polymer after exposure to grease
40 days at 66° C. | 15% max.
10% max. | D 4289, except use D 792 for density |

CONSTRUCTION

Tieback anchors shall be installed in accordance with the manufacturer's recommendations. In case of a conflict between the manufacturer's recommendations and these special provisions, these special provisions shall prevail.

Water and grout from tieback anchor construction operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into landscaping, gutters, or other drainage facilities. Excessive amounts of water shall not be used in any of the drilling and the tieback anchor installation procedures.

Tieback anchor steel shall be protected prior to completion of all grouting against rust, corrosion and physical damage in conformance with the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications. In addition, there shall be no evidence of distress in the plastic sheathing or crushing of the cement grout within the pregrouted sheathing.

The tieback anchorage assembly shall be protected against rust, corrosion, and physical damage prior to completion of all grouting of enclosure or encasement in concrete.

The tieback anchor installation method selected by the Contractor shall be sufficient to achieve the loadings specified herein. Holes for tieback anchors shall be drilled in the foundation to a depth sufficient to provide the necessary bond length beyond the minimum unbonded length shown on the plans.

Tieback anchorage holes shall be drilled by either the rotary or rotary percussion drilling method.

The top level of tiebacks shall be installed in drilled holes advanced with drill casing. Drill casing shall be removed while filled with grout as the initial grout is being placed.

The diameter of the drilled hole shall be large enough to provide a minimum of 25 mm grout cover within the bonded length of the tendon. Centralizers shall be used within the bonded length of the tendon.

Pregrouting shall occur at least 48 hours before placing the tendon in the drilled hole.

Prior to installing each anchor assembly into the drilled hole, the anchor assembly shall be clean and free of oil, grease, or other extraneous substances, and any damage to the sheathing shall be repaired or replaced.

Grout for all stages of tieback construction shall be injected at the low end of the void being filled and shall be expelled at the high end until there is no evidence of entrapped air, water, or diluted grout. The grout shall be placed using grout tubes, unless another method is approved by the Engineer. The quantity of the grout and the grout pressures shall be recorded.

After placing initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Additional requirements for tiebacks with bar type tendons are as follows:

- A. The bar tendons in the unbonded area shall be sheathed with smooth sheathing that extends into the steel tube of the permanent tieback anchorage assembly, as shown on the plans. For this portion of smooth sheathing there is no minimum wall thickness and the sheathing shall be either PVC or HDPE.
- B. In addition, bar tendons shall be sheathed full-length with corrugated sheathing. The annular space between the bar and the corrugated sheathing shall be pregrouted prior to placing the tendons in the drilled hole. The bar shall be centered in the sheathing.
- C. There shall be a seal between the smooth sheathing and the corrugated sheathing at the top and bottom of the length of smooth sheathing.

- D. For bar tendons, the initial grout in the drilled hole may be placed before or after insertion of the bar tendon.
- E. For drilled holes 150 mm in diameter or less, the initial grout outside of the corrugated sheathing shall extend to within 150 mm of the end of the steel tube of the anchorage assembly. Grout in the unbonded length shall not be placed under pressure. For drilled holes greater than 150 mm in diameter, the initial grout outside of the corrugated sheathing shall be within the limits of the bonded length. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Additional requirements for tiebacks with strand type tendons are as follows:

- A. The Contractor shall have the option of using Alternative A or Alternative B as shown on the plans for tieback tendons.
- B. For Alternative A and Alternative B, strand tendons shall be sheathed with corrugated sheathing. The individual strands within the bonded length shall be separated by spaces so that the entire surface of each strand is bonded in the grout. The maximum spacing of strand spacers shall be 1.50 m. The strand spacers shall be plastic and of a construction and strength that will provide support for the individual strands during construction operations.
- C. For Alternative A, the bonded length of the tendon shall be sheathed with corrugated sheathing and pregrouted full length of the corrugated sheathing before placing the tendon in the hole. The corrugated sheathing shall lap the smooth sheathing on the strands 600 mm. For this alternative, the initial grout in the drilled hole may be placed before or after insertion of the strand tendon.
- D. For Alternative B, the tendon shall be sheathed full length with corrugated sheathing and pregrouted a minimum length of 600 mm before placing the tendon in the hole. After placing the tendon into the drilled hole and before placing initial grout in the drilled hole, the grout shall be injected at the low end of the corrugated sheathing and the grout shall be expelled at the high end until there is no evidence of entrapped air, water, or diluted grout.
- E. For Alternative A and Alternative B, anchors in holes of 150 mm diameter and smaller shall be initially grouted to within 150 mm of the end of the steel tube. Grout in the unbonded length shall not be placed under pressure. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.
- F. For Alternative A and Alternative B, anchors in holes of greater than 150 mm diameter shall be initially grouted within the bond length. After placing the initial grout, the anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during testing operations.

Testing

All tiebacks shall be load tested by either a performance test or a proof test. The magnitude of applied test loads shall be determined with a calibrated pressure gauge or a load cell. Movements of the end of the tieback, relative to an independent fixed reference point, shall be measured and recorded to the nearest 0.025 mm at each load increment during the load tests. The Contractor shall perform the measuring and recording and shall furnish the Engineer copies of the recorded movements.

A minimum of 12 tieback anchors at Retaining Wall ML 239R (Br. No. 57E0059), 3 tieback anchors at Retaining Wall ML197R (Br. No. 57E0045), and 3 tieback anchors at Retaining Wall ML 219L (Br. No. 57E0046) shall be performance tested. The Engineer shall determine the location of the tiebacks to be performance tested.

The performance test or proof test shall be conducted by measuring the test load applied to the tieback and the tieback end movement during incremental loading and unloading of the anchor in accordance with the loading schedule. The test load shall be held constant for 10 minutes. During the test load hold, the movement of the end of the tendon shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. If the total movement between one minute and 10 minutes exceeds one mm, the test load shall be held for an additional 50 minutes. Total movement shall be measured at 15, 20, 25, 30, 45, and 60 minutes. If the test load is held for 60 minutes, a creep curve showing the creep movement between one minute and 60 minutes shall be plotted as a function of the logarithm of time.

| LOADING SCHEDULES | | |
|----------------------------------------------------|-------------------|-------------------|
| PERFORMANCE TEST | PROOF TEST | |
| | (CONT'D) | |
| AL | AL | AL |
| 0.25T | 0.25T | 0.25T |
| AL | 0.50T | 0.50T |
| 0.25T | 0.75T | 0.75T |
| 0.50T | 1.00T | 1.00T |
| AL | 1.25T | 1.25T |
| 0.25T | AL | 1.50T (TEST LOAD) |
| 0.50T | 0.25T | AL |
| 0.75T | 0.50T | |
| AL | 0.75T | |
| 0.25T | 1.00T | |
| 0.50T | 1.25T | |
| 0.75T | 1.50T (TEST LOAD) | |
| 1.00T
(CONT'D) | AL | |
| T = Design force for the anchor shown on the plans | | |
| AL = Alignment load | | |

For performance and proof tests, each increment of load shall be applied in less than one minute and held for at least one minute but not more than 2 minutes or as specified above. The observation period for the load hold shall start when the pump begins to apply the last increment of load.

The jacking equipment, including the tendon movement measuring system, shall be stable during all phases of the tieback loading operations.

All tiebacks not performance tested shall be proof tested. If 1.5 times the design force cannot be obtained, the tieback shall be redesigned and replaced. Tieback anchors shall not be retested, unless the tieback bond length is post-grouted after the unacceptable test.

A performance tested tieback is acceptable if:

- A. The measured elastic movement exceeds 0.80 of the theoretical elongation of the unbonded length plus the jacking length at the maximum test load; and
- B. The creep movement between one and 10 minutes is less than 1.0 mm.

A proof tested tieback is acceptable if:

- A. The pattern of movements is similar to that of adjacent performance tested tiebacks; and
- B. The creep movement between one and 10 minutes is less than 1.0 mm.

Performance tested or proof tested tiebacks which fail to meet acceptance criterion B will be acceptable if the maximum load is held for 60 minutes and the creep curve plotted from the movement data indicates a creep rate of less than 2.0 mm for the last log cycle of time.

Lock-off

After successful testing of the tiebacks at Retaining Walls ML 197R (Br. No. 57E0045) and ML 219L (Br. No. 57E0046), the tiebacks shall be tensioned against the structure and locked off at a load equal to 0.75T. After successful testing of the tiebacks at Retaining Walls ML 239R (Br. No. 57E0059), the tiebacks shall be tensioned against the structure and locked off at a load equal to 0.75T. The lock-off force is the load on the jacks which is maintained while the anchor head or anchor nuts on the tieback are permanently set. Immediately after lock-off, a lift-off test shall be performed to demonstrate that the specified lock-off force was obtained. Adjustments in the shim thickness shall be made if required to maintain the specified lock-off force.

For strand tendons, the permanent wedges shall be fully set in the anchor head while the tendon is stressed to the test load of 1.50 T, and then locked off at the lock-off force by removal of the shims or other appropriate means.

Grouting to the level of secondary grouting to the dimensions shown on the plans shall be completed only after successful testing and lock-off has been completed. At least 24 hours after the secondary grout has set, the remaining void in the steel tube and bearing plate shall be filled with grout. Grout shall be injected at the low end and expelled at the high end

until there is no evidence of entrapped air or water. A minimum grout head of 600 mm shall be maintained until the grout has set.

MEASUREMENT AND PAYMENT

No payment will be made for tiebacks which do not pass the specified testing requirements.

Tieback anchors will be measured and paid for by the unit, and the number for payment will be determined by the requirements of the details shown on the plans. No change in the number of tieback anchors to be paid for will be made because of the use by the Contractor of an alternative number of tiebacks.

The contract unit price paid for tieback anchor shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the tieback anchors, including special measures taken to contain grout in the drilled hole, testing, and furnishing and installing anchorage assemblies, complete in place, including repair or replacement of sheathing as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.62 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.

When a roughened concrete surface is shown on the plans, the existing concrete surface shall be roughened to a full amplitude of approximately 6 mm by abrasive blasting, water blasting, or mechanical equipment.

DECK CRACK TREATMENT

When methacrylate resin work is to be conducted within 31 meters of a residence, business, or public space, including sidewalks under a structure, the Contractor shall notify the public at least 7 days before starting work and monitor airborne emissions during the work. Public notification and monitoring of airborne emissions shall conform to the following:

- A. The public safety plan required in Section 51-1.17A, "Deck Crack Treatment," of the Standard Specifications shall include a copy of the notification letter and a list of addresses and locations where the letter will be delivered and posted. The letter shall state the methacrylate resin work locations, dates, times, and what to expect. The letter shall be delivered to each residence and each business within 31 meters of the methacrylate resin work. The letter shall be delivered to local fire and police responders, and it shall be posted at the job site.
- B. The public safety plan shall include an airborne emissions monitoring plan prepared by a certified industrial hygienist and a copy of the hygienist's certification. Airborne emissions shall be monitored at a minimum of 4 points including the point of mixing, the point of application, and the point of nearest public contact, as determined by the Engineer. At the completion of methacrylate resin work, a report by the certified industrial hygienist with results of the airborne emissions monitoring plan shall be submitted to the Engineer.

AGGREGATE GRADINGS

The aggregate grading of concrete for pony bent girders shall be the 9.5 mm or 12.5 mm maximum combined aggregate grading and shall conform to the requirements in Section 90-3, "Aggregate Gradings," of the Standard Specifications.

FALSEWORK

Falsework shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

In addition to the provisions in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, the time to be provided for the Engineer's review of the working drawings for specific structures, or portions thereof, shall be as follows:

| Structure or Portion of Structure | Total Review Time - Weeks |
|-----------------------------------|---------------------------|
| Bridge No. 57-0909 | 5 |

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 175 N/mm for each 3 mm 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 be in writing, 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.

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 three 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 three 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.

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 roughening existing concrete surfaces to a full amplitude of approximately 6 mm, where shown on the plans, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for public notification and airborne monitoring for deck crack treatment shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge, and no additional compensation will be allowed therefor.

10-1.63 DRILL AND BOND DOWELS

Drilling and bonding dowels shall conform to the details shown on the plans, the provisions in Section 83-2.02D(1), "General," of the Standard Specifications, and these special provisions.

Dowels shall conform to the provisions for bar reinforcement in "Reinforcement" of these special provisions.

If reinforcement is encountered during drilling before the specified depth is attained, the Engineer shall be notified. Unless the Engineer approves coring through the reinforcement, the hole will be rejected and a new hole, in which reinforcement is not encountered, shall be drilled adjacent to the rejected hole to the depth shown on the plans.

Unless otherwise provided, dowels to be bonded into drilled holes will be paid for as bar reinforcing steel (bridge).

Unless otherwise provided, drilling and bonding dowels will be measured and paid for by the meter determined by the number and the required depth of holes as shown on the plans or as ordered by the Engineer.

The contract price paid per meter for drill and bond dowel shall include full compensation for furnishing all labor, materials (except reinforcing steel dowels), tools, equipment, and incidentals, and for doing all the work involved in drilling the holes, including coring through reinforcement when approved by the Engineer, and bonding the dowels, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.64 CORE CONCRETE

Coring concrete shall consist of coring holes through reinforced concrete bridge members as shown on the plans and in conformance with these special provisions.

The holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes.

Water for core drilling operations shall be from the local domestic water supply or shall not contain more than 1000 parts per million of chlorides as Cl, nor more than 1300 parts per million of sulfates as SO₄, nor shall the water contain any impurities in a sufficient amount that would cause discoloration of the concrete or produce etching of the surface.

Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

Coring concrete will be measured by the meter as core concrete of the sizes listed in the Engineer's Estimate. The cored concrete will be measured along the centerline of the hole without deduction for expansion joints.

The contract price paid per meter for core concrete of the sizes 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 coring the holes, including control of water from core drilling and repairing any damaged reinforcement, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-1.65 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)

Architectural texture for concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Architectural textures listed below are required at concrete surfaces shown on the plans:

- A. Swirled plaster texture
- B. Architectural surface (barrier)

The architectural swirled plaster and architectural surface (barrier) texture shall simulate a formed relief constructed to the dimensions and shapes shown on the plans. Corners at the intersection of plane surfaces shall be sharp and crisp without easing or rounding. A Class 1 surface finish shall be applied to the architectural texture.

REFEREE SAMPLE

The architectural texture shall match the texture, color and pattern of the referee sample located at Office of the District Director of Transportation at 4050 Taylor Street, San Diego, CA 92110, Telephone (619) 688-6670 available for inspection by bidders.

TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural textures. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural texture for concrete-surfaces.

FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

| Description | ASTM Designation: | Range |
|-------------------------------|-------------------|------------|
| Elastomeric material | | |
| Shore A hardness | D 2240 | 20 to 65 |
| Tensile strength (MPa) | D 412 | 0.9 to 6.2 |
| Semi-elastomeric polyurethane | | |
| Shore D hardness | D 2240 | 55 to 65 |
| Tensile strength (MPa) | D 2370 | 18 minimum |

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

RELEASING FORM LINERS

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain. The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

ABRASIVE BLASTING

The architectural texture shall be abrasive blasted with fine abrasive to remove the sheen without exposing coarse aggregate.

CURING

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

MEASUREMENT AND PAYMENT

Architectural texture will be measured and paid for by the square meter.

The contract price paid per square meter for architectural texture of the 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 architectural texture, complete in place, including test panels, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.66 REINFORCEMENT

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The Department's mechanical splices prequalified list can be found at the following internet site:

http://www.dot.ca.gov/hq/esc/approved_products_list/

The provisions of "Welding Quality Control" of these special provisions shall not apply to resistance butt welding.

Reinforcement shown on the plans to be galvanized shall be galvanized in conformance with the provisions 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.

10-1.67 SHOTCRETE

Shotcrete shall conform to the provisions in Section 51, "Concrete Structures," and Section 53, "Shotcrete," of the Standard Specifications and these special provisions.

Shotcrete operations shall completely encase all reinforcement and other obstructions shown on the plans. Exceptional care shall be taken to properly encase the reinforcement and other obstructions with shotcrete.

Attention is directed to the section, "Order of Work," in these special provisions regarding furnishing preconstruction shotcrete test panels.

Except for finish coats, shotcrete shall be applied by the wet-mix process only.

Finish coats, applied by the dry-mix process, may be used only when approved by the Engineer.

Shotcrete shall have a minimum compressive strength of 22.5 MPa at 28 days or as shown on the plans, whichever is greater. No shotcrete work shall be performed prior to verification by the Engineer of the required compressive strength.

Splicing of reinforcing bars No. 22 or larger in shotcrete shall be by butt splicing only.

The Contractor shall be responsible for obtaining and testing all required preconstruction and production test cores. All coring and testing shall be at the Contractor's expense and performed in the presence of the Engineer, unless otherwise directed. The Engineer shall be notified a minimum of 24 hours prior to the Contractor performing any coring or testing operations.

All cores shall be obtained and tested for compressive strength in conformance with the requirements in ASTM Designation: C 42. Cores used for determining compressive strength shall not contain any bar reinforcement or other obstructions. The testing shall be performed at an independent testing facility approved by the Engineer. A copy of the test results shall be furnished to the Engineer within 5 days following completion of testing.

All test panels 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.

PRECONSTRUCTION REQUIREMENTS

Prior to performing shotcrete work, the Contractor shall construct at least 2 preconstruction shotcrete test panels for each mixture being considered unless otherwise specified.

The nozzleperson shall have a minimum of 3000 hours experience as a nozzleperson on projects with a similar application.

At least 10 working days prior to constructing any shotcrete test panels, the Contractor shall submit to the Engineer for approval, a Quality Control Plan (QCP) for the proposed method of shotcrete placement. The plan shall include the following:

- A. The number and qualifications of nozzlepersons available to place shotcrete, the number of nozzlepersons on-site at any time during the shotcrete placement, description of their work schedule, and the procedures for avoiding fatigue of any nozzleperson.
- B. The proposed method of placing shotcrete, including, but not limited to, application rates, details of any proposed construction joints and their locations, and methods for achieving the required thickness and surface finish.
- C. The procedure for curing shotcrete surfaces.
- D. The description of a debris containment system, to be used during the cleaning of bar reinforcing steel and concrete and placing of shotcrete, as required to provide for public safety.

The Engineer shall have 10 working days to review and approve the QCP submittal after a complete plan has been received. No construction of shotcrete test panels shall be performed until the QCP is approved by the Engineer. Should the Engineer fail to complete the review within this 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 approving the QCP, 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.

Preconstruction shotcrete test panels shall be constructed by the nozzlepersons and application crew scheduled to do the work, using equipment, materials, mixing proportions, ambient temperatures and procedures proposed for the work. The preconstruction shotcrete test panels shall conform to the following:

- A. One shotcrete test panel, of the size determined by the Contractor, shall be unreinforced and shall have 3 cores taken from it and tested for compressive strength. The compressive strength shall be the average strength of the 3 cores, except that, if any core should show evidence of improper coring, the core shall be discarded and the compressive strength shall be the average strength of the remaining cores. The test panel shall be identified and submitted to the Engineer with the test results including a description of the mixture, proportions, and ambient temperature.
- B. One shotcrete test panel shall have the same (1) thickness, (2) bar size and amount of bar reinforcement or other obstructions and (3) positioning of bar reinforcement or obstructions as the most heavily reinforced section of shotcrete to be placed. The test panel shall be square with the length of the sides equal to at least 3 times the thickness of the most heavily reinforced section of shotcrete to be placed, but not less than 750 mm. After a minimum 7 days of cure, the test panel shall be broken by the Contractor, in the presence of the Engineer, into pieces no larger than 250 mm in greatest dimension. The surfaces of the broken pieces shall be dense and free of laminations and sand pockets, and shall verify that the bar reinforcement or other obstructions are completely encased.
- C. Both test panels shall be cured under conditions similar to the actual work.
- D. At the option of the Contractor, cores to be used for determining the compressive strength may be taken from the reinforced test panel described above in lieu of making a separate unreinforced test panel as described above. The compressive strength shall be the average strength of the 3 cores, except that, if any core should show evidence of improper coring or contains bar reinforcement or other obstructions, the core shall be discarded and the compressive strength shall be the average strength of the remaining cores. If cores are taken from the reinforced test panel, the panel shall not be broken into pieces, as described above, until it has cured for a minimum of 14 days.

The requirements for constructing preconstruction shotcrete test panels may be eliminated, when approved by the Engineer, if a test panel report and certified compressive strength test data are furnished from a State highway project with a similar application of approximately equal thickness, including similar amounts and placement of reinforcement or other obstructions. The nozzle person, proposed to be used, shall have constructed the test panel described in the test panel report. The test panel report shall list the names of the application crew, equipment used, materials, mixing proportions, ambient temperatures and procedures used to make the test panels. The certified compressive strength test data shall be for cores taken from the same test panels.

PLACING

An air blowpipe shall be used during shotcrete placement to remove rebound, overspray and other debris from the areas to receive shotcrete.

Construction joints shall be tapered, and shall conform to the provisions in Sections 51-1.13, "Bonding," of the Standard Specifications.

All overspray and rebound shall be removed prior to final set and before placement of shotcrete on adjacent surfaces.

Rebound or any other material which has already exited the nozzle shall not be reused.

Shotcrete shall be cured in conformance with the provisions of Section 90-7.03, "Curing Structures," of the Standard Specifications.

When a finish coat is to be used, all loose, uneven or excess material, glaze, and rebound shall be removed by brooming, scraping, or other means and the surface left scarified. Any surface deposits which take a final set shall be removed by abrasive blasting. Prior to placing the finish coat, the receiving surface shall be washed down with an air-water blast.

Shotcrete extending into the space shown on the plans for cast-in-place concrete shall be removed.

TESTING AND ACCEPTANCE

At least 3 production shotcrete test cores shall be taken from each 30 square meters or portion thereof of shotcrete placed each day. The cores shall be 76 mm in diameter. The location where cores are to be taken will be designated by the Engineer. Test cores shall be identified by the Contractor and a description of the core location and mixture, including proportions, shall be submitted to the Engineer with the test cores, immediately after coring. Cored holes shall be filled with mortar in conformance with the provisions in Section 51-1.135, "Mortar," of the Standard Specifications.

Upon receipt of the cores, the Engineer will perform a visual examination to determine acceptance, as described below. Within 48 hours after receipt, the Engineer will return the cores to the Contractor for compressive strength testing.

The compressive strength test shall be performed using the shotcrete production test cores described above. The compressive strength shall be the average strength of the 3 cores, except that, if any core should show evidence of improper coring, the core shall be discarded and the compressive strength shall be the average strength of the remaining cores.

The basis of acceptance for production shotcrete test cores shall be (1) that the core is dense and free of laminations and sand pockets, and shows that the reinforcement or other obstructions are completely encased and (2) the same as specified for test cylinders in the fourth and fifth paragraphs of Section 90-9.01, "General," of the Standard Specifications.

If any production test core shows signs of defective shotcrete as described in (1) above, the shotcrete represented by such test core will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the shotcrete placed in the work are acceptable.

The surface finish of the shotcrete shall conform to the provisions of Section 51-1.18, "Surface Finishes," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Full compensation for the Quality Control Plan, constructing and breaking test panels, furnishing and testing cores and patching cored holes shall be considered as included in the contract price paid per cubic meter for shotcrete and no additional compensation will be allowed therefor.

10-1.68 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" in Section 8, "Materials," of these special provisions.

The following substitutions of high-strength steel fasteners shall be made:

| METRIC SIZE SHOWN ON THE PLANS | SIZE TO BE SUBSTITUTED |
|----------------------------------------------------------|-----------------------------------------------------------|
| ASTM Designation: A 325M
(Nominal bolt diameter (mm)) | ASTM Designation: A 325
(Nominal bolt diameter (inch)) |
| 13, 12.70, or M12 | 1/2 |
| 16, 15.88, or M16 | 5/8 |
| 19, 19.05, or M20 | 3/4 |
| 22, 22.22, or M22 | 7/8 |
| 24, 25, 25.40, or M24 | 1 |
| 29, 28.58, or M27 | 1 1/8 |
| 32, 31.75, or M30 | 1 1/4 |
| 38, 38.10, or M36 | 1 1/2 |

ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE

Rotational capacity tests shall be performed on all lots of high-strength fastener assemblies prior to shipment of these lots to the project site. Zinc-coated assemblies shall be tested after all fabrication, coating, and lubrication of components has been completed. One hardened washer shall be used under each nut for the tests.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

Each combination of bolt production lot, nut lot, and washer lot shall be tested as an assembly.

A rotational capacity lot number shall be assigned to each combination of lots tested. Each shipping unit of fastener assemblies shall be plainly marked with the rotational capacity lot number.

Two fastener assemblies from each rotational capacity lot shall be tested.

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of long bolts. Fasteners are considered to be long bolts when full nut thread engagement can be achieved when installed in a bolt tension measuring device:

A. Long Bolt Test Equipment:

1. Calibrated bolt tension measuring device with adequate tension capacity for the bolts being tested.
2. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Long Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel beam or member, such as a girder flange or cross frame, to which the bolt tension measuring device will be attached. The device shall be accessible from the ground.

B. Long Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Insert the bolt into the bolt tension measuring device and install the required number of washers, and additional spacers as needed, directly beneath the nut to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug tension shall not be less than the Table A value but may exceed the Table A value by a maximum of 2 kips.

Table A

| High-Strength Fastener Assembly Tension Values to Approximate Snug-Tight Condition | |
|------------------------------------------------------------------------------------|---------------------|
| Bolt Diameter (inches) | Snug Tension (kips) |
| 1/2 | 1 |
| 5/8 | 2 |
| 3/4 | 3 |
| 7/8 | 4 |
| 1 | 5 |
| 1 1/8 | 6 |
| 1 1/4 | 7 |
| 1 3/8 | 9 |
| 1 1/2 | 10 |

5. Match-mark the assembly by placing a heavy reference start line on the face plate of the bolt tension measuring device which aligns with 1) a mark placed on one corner of the nut, and 2) a radial line placed across the flat on the end of the bolt, or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make an additional mark on the face plate, either 2/3 of a turn, one turn, or 1 1/3 turn clockwise from the heavy reference start line, depending on the bolt length being tested as shown in Table B.

Table B

| Required Nut Rotation for Rotational Capacity Tests ^(a,b) | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Bolt Length (measured in Step 1) | Required Rotation (turn) |
| 4 bolt diameters or less | 2/3 |
| Greater than 4 bolt diameters but no more than 8 bolt diameters | 1 |
| Greater than 8 bolt diameters, but no more than 12 bolt diameters ^(c) | 1 1/3 |
| <p>(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees.</p> <p>(b) Applicable only to connections in which all material within grip of the bolt is steel.</p> <p>(c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.</p> | |

- Turn the nut to achieve the applicable minimum bolt tension value listed in Table C. After reaching this tension, record the moving torque, in foot-pounds, required to turn the nut, and also record the corresponding bolt tension value in pounds. Torque shall be measured with the nut in motion. Calculate the value, T (in ft-lbs), where $T = [(the\ measured\ tension\ in\ pounds) \times (the\ bolt\ diameter\ in\ inches) / 48\ in/ft]$.

Table C

| Minimum Tension Values for High-Strength Fastener Assemblies | |
|--------------------------------------------------------------|------------------------|
| Bolt Diameter (inches) | Minimum Tension (kips) |
| 1/2 | 12 |
| 5/8 | 19 |
| 3/4 | 28 |
| 7/8 | 39 |
| 1 | 51 |
| 1 1/8 | 56 |
| 1 1/4 | 71 |
| 1 3/8 | 85 |
| 1 1/2 | 103 |

- Turn the nut further to increase bolt tension until the rotation listed in Table B is reached. The rotation is measured from the heavy reference line made on the face plate after the bolt was snug-tight. Record this bolt tension.
- Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), 2) the bolt tension measured in Step 7 shall be greater than or equal to the applicable turn test tension value listed in Table D, 3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 4) the bolt does not shear from torsion or fail during the test, and 5) the assembly does not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

| Turn Test Tension Values | |
|---------------------------|-----------------------------|
| Bolt Diameter
(inches) | Turn Test Tension
(kips) |
| 1/2 | 14 |
| 5/8 | 22 |
| 3/4 | 32 |
| 7/8 | 45 |
| 1 | 59 |
| 1 1/8 | 64 |
| 1 1/4 | 82 |
| 1 3/8 | 98 |
| 1 1/2 | 118 |

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of short bolts. Fasteners are considered to be short bolts when full nut thread engagement cannot be achieved when installed in a bolt tension measuring device:

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F436.
4. Steel plate or girder with a hole to install bolt. The hole size shall be 1.6 mm greater than the nominal diameter of the bolt to be tested. The grip length, including any plates, washers, and additional spacers as needed, shall provide the proper number of threads within the grip, as required in Step 2 of the Short Bolt Test Procedure.

B. Short Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Install the bolt into a hole on the plate or girder and install the required number of washers and additional spacers as needed between the bearing face of the nut and the underside of the bolt head to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug condition shall be the full manual effort applied to the end of a 305 mm long wrench. This applied torque shall not exceed 20 percent of the maximum allowable torque in Table E.

Table E

| Maximum Allowable Torque for High-Strength Fastener Assemblies | |
|----------------------------------------------------------------|-----------------|
| Bolt Diameter (inches) | Torque (ft-lbs) |
| 1/2 | 145 |
| 5/8 | 285 |
| 3/4 | 500 |
| 7/8 | 820 |
| 1 | 1220 |
| 1 1/8 | 1500 |
| 1 1/4 | 2130 |
| 1 3/8 | 2800 |
| 1 1/2 | 3700 |

- Match-mark the assembly by placing a heavy reference start line on the steel plate or girder which aligns with 1) a mark placed on one corner of the nut and 2) a radial line placed across the flat on the end of the bolt or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make 2 additional small marks on the steel plate or girder, one 1/3 of a turn and one 2/3 of a turn clockwise from the heavy reference start line on the steel plate or girder.
- Using the torque wrench, tighten the nut to the rotation value listed in Table F. The rotation is measured from the heavy reference line described in Step 5 made after the bolt was snug-tight. A second wrench shall be used to prevent rotation of the bolt head during tightening. Measure and record the moving torque after this rotation has been reached. The torque shall be measured with the nut in motion.

Table F

| Nut Rotation Required for Turn-of-Nut Installation ^(a,b) | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Bolt Length (measured in Step 1) | Required Rotation (turn) |
| 4 bolt diameters or less | 1/3 |
| (a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees. | |
| (b) Applicable only to connections in which all material within grip of the bolt is steel. | |

- Tighten the nut further to the 2/3-turn mark as indicated in Table G. The rotation is measured from the heavy reference start line made on the plate or girder when the bolt was snug-tight. Verify that the radial line on the bolt end or on the exposed portions of the threads of tension control bolts is still in alignment with the start line.

Table G

| Required Nut Rotation for Rotational Capacity Test | |
|----------------------------------------------------|--------------------------|
| Bolt Length (measured in Step 1) | Required Rotation (turn) |
| 4 bolt diameters or less | 2/3 |

- Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Short Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: 1) the measured moving torque from Step 6 shall be less than or equal to the maximum allowable torque from Table E, 2) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, 3) the bolt does not shear from torsion or fail during the test, and 4) the assembly shall not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE

Installation tension tests and rotational capacity tests on high-strength fastener assemblies shall be performed by the Contractor prior to acceptance or installation and after arrival of the fastener assemblies on the project site. Installation tension tests and rotational capacity tests shall be performed at the job-site, in the presence of the Engineer, on each rotational capacity lot of fastener assemblies.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

Installation tension tests shall be performed on 3 representative fastener assemblies in conformance with the provisions in Section 8, "Installation," of the RCSC Specification. For short bolts, Section 8.2, "Pretensioned Joints," of the RCSC Specification shall be replaced by the "Pre-Installation Testing Procedures," of the "Structural Bolting Handbook," published by the Steel Structures Technology Center, Incorporated.

The rotational capacity tests shall be performed in conformance with the requirements for rotational capacity tests in "Rotational Capacity Testing Prior to Shipment to Job Site" of these special provisions.

At the Contractor's expense, additional installation tension tests, tests required to determine job inspecting torque, and rotational capacity tests shall be performed by the Contractor on each rotational capacity lot, in the presence of the Engineer, if 1) any fastener is not used within 3 months after arrival on the jobsite, 2) fasteners are improperly handled, stored, or subjected to inclement weather prior to final tightening, 3) significant changes are noted in original surface condition of threads, washers, or nut lubricant, or 4) the Contractor's required inspection is not performed within 48 hours after all fasteners in a joint have been tensioned.

Failure of a job-site installation tension test or a rotational capacity test will be cause for rejection of unused fasteners that are part of the rotational capacity lot.

When direct tension indicators are used, installation verification tests shall be performed in conformance with Appendix Section X1.4 of ASTM Designation: F959, except that bolts shall be initially tensioned to a value 5 percent greater than the minimum required bolt tension.

SEALING

When zinc-coated tension control bolts are used, the sheared end of each fastener shall be completely sealed with non-silicone type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be gray in color and shall have a minimum thickness of 1.3 mm. The sealant shall be applied to a clean sheared surface on the same day that the splined end is sheared off.

WELDING

The requirement of conformance with AWS D1.5 shall not apply to work conforming to Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

10-1.69 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 559 mm x 864 mm or 279 mm x 432 mm 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-Kilometer Post, 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 150 mm 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 150 mm.

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 150 mm 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 > 4.5 mm: 100%UT and MT
t < 4.5 mm: 100% MT after root weld pass & 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 8 mm thick or where tubular sections are less than 325 mm 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 kilogram for furnish sign structure, and no additional compensation will be allowed therefor.

10-1.70 CLEAN AND PAINT SIGN STRUCTURES

Sign structures shall be cleaned and painted in conformance with the provisions in Section 56-1.05, "Surface Finish," and Section 91, "Paint," of the Standard Specifications and these special provisions.

Prior to performing any painting or paint removal, 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, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

- A. The name of each Contractor or subcontractor to be used.
- B. One copy each of all current ASTM and "SSPC: The Society for Protective Coatings" specifications or qualification procedures applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
- C. A copy of the coating manufacturer's guidelines and recommendations for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel, including testing methods and maximum allowable levels for soluble salts.
- D. Proposed methods and equipment to be used for any paint application.
- E. Proof of each of any required certifications, SSPC-QP 1, SSPC-QP 2, SSPC-QP 3. Where SSPC-QP 3 certification is required, an enclosed shop facility shall be required. Certification of AISC Sophisticated Paint Endorsement Quality Program, P-1 Enclosed endorsement, will be considered equivalent to SSPC-QP 3.

The Engineer shall have 3 weeks to approve the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is approved by the Engineer. Should the Engineer fail to complete the review within this 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 approving the PQWP, 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.

It is understood that the Engineer's approval of the Contractor's PQWP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the plans and specifications.

In addition to tubular, all other sign structures shall be cleaned and painted.

CLEAN AND PAINT UNGALVANIZED SURFACES

Ungalvanized steel surfaces to be cleaned and painted shall be dry blast cleaned in conformance with the requirements of SSPC-SP 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of no less than 40 μm nor more than 86 μm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel surfaces shall conform to the requirements for Class A, Grade 2 to 3 abrasives contained in SSPC-AB 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings," and shall not contain hazardous material.

Steel abrasives used for blast cleaning steel surfaces shall comply with the requirements of SSPC-AB 3, "Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings." If steel abrasive is recycled through shop or field abrasive blast cleaning units, the recycled abrasive shall conform to the requirements of SSPC-AB 2, "Specification for Cleanliness of Recycled Ferrous Metallic Abrasive," of the "SSPC: The Society for Protective Coatings."

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material for steel.

Abrasive blast cleaned surfaces shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the coating manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of abrasive blast cleaned steel shall be tested at the rate of 3 tests for the first 100 square meters prepared per day, and one test for each additional 100 square meters or portion thereof, at locations selected by the Engineer. When less than 100 square meters of surface area is prepared in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The

Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.

Blast cleaned surfaces shall receive a single undercoat consisting of an inorganic zinc coating conforming to the requirements in AASHTO Designation: M 300, Type I or Type II, except that: 1) the first 3 sentences of Section 5.6, "Primer Field Performance Requirements," shall not apply for Type II coatings, and 2) the entire Section 5.6.1 shall not apply for either type of inorganic zinc coating.

If the Contractor proposes to use a Type I coating, the Contractor shall furnish to the Engineer for review documentation as required in Section 5.6 of AASHTO Designation: M 300. The Contractor shall allow the Engineer 4 weeks to review the proposal.

If the Contractor proposes to use a Type II coating, the coating shall be selected from the qualified products list, which may be obtained from the Transportation Laboratory.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 8 hours of the start of blast cleaning. Abrasive blast cleaned steel shall not be exposed to relative humidity exceeding 85 percent prior to application of inorganic zinc coating.

The total dry film thickness of all applications of the inorganic zinc undercoat, including the surfaces of outside existing members within the grip under bolt heads, nuts, and washers, shall be not less than 100 μm nor more than 200 μm , except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 μm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Steel surfaces coated with Type II inorganic zinc coating shall be protected from conditions that may cause the coating film to dissolve. The Contractor, at the Contractor's expense, shall repair areas where the coating has dissolved by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The Contractor shall test the inorganic zinc coating prior to application of finish coats. The locations of the tests will be determined by the Engineer. The Contractor shall determine the sequence of the testing operations. The testing for adhesion and hardness will be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. At the Contractor's expense, satisfactory access shall be provided to allow the Engineer to determine the location of the tests.

The inorganic zinc coating shall pass the following tests:

- A. The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Engineer will select 3 locations per girder or 100 square meters of painted surface, whichever is less, for adhesion testing. If less than 100 square meters of steel is painted in a work shift, the Engineer will select 3 areas painted during the work shift for testing. If 2 or more of the locations tested fail to meet adhesion requirements, the entire area represented by the tests will be rejected. If one of the locations tested fails to meet adhesion requirements, an additional 3 locations shall be tested. Should any of the additional locations fail to meet adhesion requirements, the entire area represented by the tests will be rejected. The Contractor, at the Contractor's expense, shall repair the rejected area by blast cleaning and repainting with inorganic zinc to the specified thickness. Test locations for areas of inorganic zinc meeting adhesion testing requirements shall be repaired by application of organic zinc primer as specified in Section 91-1.04, "Materials," of the Standard Specifications to the specified minimum dry film thickness.

- B. Areas of inorganic zinc coating where finish coats are to be applied shall be tested by the Contractor for soluble salts using a Class A or B retrieval method as described in Technology Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates," of the "SSPC: The Society for Protective Coatings," and cleaned so the maximum level of soluble salts does not exceed the lesser of the manufacturer's written recommendations or 10 micrograms per square centimeter. Areas of inorganic zinc coating shall be tested at the rate of 3 tests for the first 100 square meters to be painted per day and one test for each additional 100 square meters or portion thereof at locations selected by the Engineer. When less than 100 square meters of surface area is painted in a shift, at least 2 tests shall be performed. If levels of soluble salts exceed the maximum allowed by these special provisions, the entire area represented by the testing will be rejected. The Contractor shall perform additional cleaning and testing of rejected areas until soluble salt levels conform to these requirements.
- C. Prior to application of finish coats, the inorganic zinc coating shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Water Borne Inorganic Zinc Primers

- A. The surface pH of the inorganic zinc primer shall be tested by wetting the surface with de-ionized water for a minimum of 15 minutes but no longer than 30 minutes and applying pH paper with a capability of measuring in increments of 0.5 pH units. At least 2 surface pH readings shall be taken for every 50 square meters or portion thereof. If less than 50 square meters of steel is coated in a single shift or day, at least 2 surface pH readings shall be taken for primer applied during that period. Application of finish coats will not be permitted until the surface pH is less than or equal to 7.
- B. Dry to solvent insolubility for water borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752, except that water shall be the solvent. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

Additional Requirements for Solvent Borne Inorganic Zinc Primers

- A. Dry to solvent insolubility for solvent borne inorganic zinc primers shall be determined in conformance with the requirements in ASTM Designation: D 4752. The resistance rating shall be not less than 4. Areas of inorganic zinc coating shall be tested for solvent insolubility at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating represented by the tested area that does not meet the solvent insolubility requirements will be rejected. The Contractor, at the Contractor's expense, shall repair rejected areas by blast cleaning and repainting with inorganic zinc coating to the specified thickness.
- B. Surface hardness of solvent borne inorganic zinc shall be a minimum 2H when measured in conformance with the requirements in ASTM Designation: D 3363. Areas of inorganic zinc coating shall be tested at the rate of one test per 50 square meters or portion thereof. Inorganic zinc coating that fails to meet the surface hardness requirements shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The Contractor, at the Contractor's expense, shall retest all rejected areas of inorganic zinc coating after repairs have been completed.

All areas of inorganic zinc coating shall be water rinsed in conformance with the requirements in Section 59-1.03, "Application," of the Standard Specifications and these special provisions. Areas of the coating removed by water rinsing shall be reapplied in conformance with the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications and these special provisions. Except as approved by the Engineer, a minimum time of 72 hours shall be allowed between application of inorganic zinc coating and water rinsing.

Exposed area of inorganic zinc coating shall receive a minimum of 2 finish coats of an exterior grade latex paint supplied by the manufacturer of the inorganic zinc coating.

The first finish coat shall be applied within 48 hours following water rinsing and passing the soluble salt testing requirements herein.

The finish coat paint shall be formulated for application to inorganic zinc coating, shall meet the requirements for SSPC-Paint 24, "Latex Semi-Gloss Exterior Topcoat," of the "SSPC: The Society for Protective Coatings," and shall conform to the following:

- A. No visible color change in the finish coats shall occur when tested in conformance with the requirements of ASTM Designation: G 53 using FS 40 UV-B bulbs for a minimum of 38 cycles. The cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C and 4 hours of condensate exposure at 40°C.
- B. The vehicle shall be an acrylic or modified acrylic copolymer with a minimum of necessary additives.

The first finish coat shall be applied in 2 applications. The first application shall consist of a spray applied mist application. The second application shall be applied after the mist application has dried to a set to touch condition as determined by the procedure described in Section 7 of ASTM Designation: D1640. The total dry film thickness of both applications of the first finish coat shall be not less than 50 µm.

Except as approved by the Engineer, a minimum drying time of 12 hours shall be allowed between finish coats.

The second finish coat color for tubular sign structures shall be a tan color matching Federal Standard Number 595B, No 22563. The total dry film thickness of the applications of the second finish coat shall be not less than 50 µm.

The 2 finish coats shall be applied in 3 or more applications to a total dry film thickness of not less than 100 µm nor more than 200 µm.

The total dry film thickness of all applications of inorganic zinc coating and finish coat paint shall be not less than 200 µm nor more than 350 µm.

PAYMENT

Full compensation for water rinsing shall be considered as included in the contract price paid per kilogram for furnish sign structure of the type involved and no additional compensation will be allowed therefor.

Full compensation for conforming to the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: 1 The Society for Protective Coatings" shall be considered as included in the contract price paid per kilogram for furnish sign structure of the type involved, and no additional compensation will be allowed therefor.

10-1.71 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. Type N, Type P, and Type R marker panels mounted on a post with a roadside sign shall be considered to be sign panels and will not be paid for as markers.

10-1.72 WEED CONTROL MAT (RUBBER)

Weed control mat (rubber) work shall consist of furnishing and placing rubber weed control mat, in conformance with the Standard Specifications, these special provisions, as shown on the plans, and as directed by the Engineer.

MATERIALS

Weed Control Mat

Weed control mat shall conform to the following:

- A. Mat shall be made from 100% California derived recycled tire rubber. Mat shall not include metal, but may include polyester based tire fiber.
- B. Mat shall be near black in color. Mat shall be a uniform color without variation between tiles or lots. Variations in color may be submitted for review and approval by the Engineer.
- C. Mat shall prevent sunlight and water from reaching the soil. Mat shall contain no hole or gap openings within the mat surface.. Mat shall be flame resistant.
- D. Mat shall have overall dimensions as shown on the plans with a minimum thickness of 12.5. Mat shall have a minimum weight of 20 kilograms per square meter of material.
- E. Mat shall be pre-cut for a snug fit around post, as shown on the plans. Mat may contain scribe lines to serve as cutting guide of mat at posts, or have cut-out in-place before delivery.

The Contractor shall furnish the Engineer with a Certificate of Compliance for the rubber mat in accordance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications.

Adhesive Caulking

Adhesive caulking shall be as specified by the manufacturer.

SITE PREPARATION

Prior to weed control mat application, the areas shall be cleared as specified under " Clearing and Grubbing" in these special provisions.

Prior to placement of weed control mat, the subgrade surface shall be smooth, firm, stable and free of rocks, clods, foliage, roots or other material greater than 25 mm in diameter.

PLACEMENT

General

Weed control mat shall be placed beneath roadside signs in paved gore areas as shown on the plans, as recommended by the manufacturer, and as specified in these special provisions. Prior to the installation of the mat a written copy of the manufacturer's installation recommendations shall be provided to the Engineer

Placement Under Roadside Signs

Mats placed around roadside signposts in paved gore areas shall be the size shown on the plans.

Openings for signposts may be either prefabricated or fabricated in the field. Cuts shall be made in the mat and joined as recommended by the manufacturer. No cuts other than those required to install mat around signpost will be permitted for mat placed under signs.

Mats shall be joined in accordance with the manufacturer's recommendations and as directed by the Engineer.

Joints between mats and adjacent posts shall be sealed with adhesive caulking. After sealing, there shall be no openings between the mat and adjacent post.

Following completion of mat placement and sealing, the mat surface shall be flat, smooth, and in uniform contact with the soil surface, without bulges or wrinkles.

PAYMENT

Full compensation for weed control mat (rubber) shall be considered as included in the contract unit price paid for roadside sign – one post (Weed Control Mat Rubber) and no separate payment will be made therefor.

10-1.73 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 8 m. 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 6-mm 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 10 mm 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 1220 mm 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 1220 mm, 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 25 mm. Splices shall not be placed within 50 mm 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 pallets, 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 300 mm x 300 mm 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: B209.

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 sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B449. 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 mass between 108 mg/m² and 377 mg/m², and an average mass of 269 mg/m². 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.

RETROREFLECTIVE SHEETING

The Contractor shall furnish retroreflective sheeting for sign background and legend in accordance with ASTM Designation: D4956 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Retroreflective sheeting shall be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, and damage.

Class 1, 3, or 4 adhesive backing shall be used for Type II, III, IV, VII, VIII, and IX retroreflective sheeting. Class 2 adhesive backing may also be used for Type II retroreflective sheeting. The adhesive backing shall be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the Engineer's visual test will govern.

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: D4956 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: D4956.

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 1220 mm, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum sign shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of ± 3 mm. The face sheet shall be affixed to the frame with rivets of 5-mm diameter. Rivets shall be placed within the web of channels and shall not be placed less than 13 mm 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 ± 3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within ± 3 mm 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 25.4-mm or 63.5-mm nominal thickness.

The face of laminated panel signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H32 of 1.6-mm thickness. The back of laminated panel signs shall be fabricated from sheet aluminum alloy 3003-H14 of 1.0-mm 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 13 mm. Weight of the kraft paper shall be 300 g/m² 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 0.25-mm thick feeler gauge of 13 mm in length can be inserted into a depth of more than 13 mm 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 161 kg/m² for the following simple span lengths with a bending safety factor of 1.25:

| Panel Type | Nominal Panel Thickness | Simple Span Length |
|------------|-------------------------|--------------------|
| A | 25.4 mm | 2.7 m |
| B | 25.4 mm | 2.7 m |
| | 63.5 mm | 4.42 m |
| H | 63.5 mm | 4.42 m |

The tensile strength of laminated panels shall be at least 138 kPa when tested in accordance with the following modification and with ASTM Designations: C297 and C481, Cycle B after aging. Instead of spraying with hot water, the specimen shall be totally immersed in 70°C hot water. When requested by the Engineer or the Transportation Laboratory, at least one test sample of 300 mm x 300 mm in size shall be taken for every 186 m² 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 5 mm 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 1524 mm or less, the laminated panels shall be fabricated with no horizontal joints, splices or seams. For signs with a depth of greater than 1524 mm, the laminated panels may be fabricated in two panels.

The face of laminated panels shall be flat with a tolerance of ± 8 mm per meter 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 mm. Non-adjoining edges from one corner to the other corner shall not deviate by more than 3 mm 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 +3 mm or -13 mm of the detailed dimensions. The difference in length between adjoining panels of multiple panel signs shall not be greater than 13 mm.

Overhead laminated panel signs shall be Type A and have a nominal thickness of 25.4 mm. The back of the laminated panels shall be painted the same color as the sign structure.

For overhead laminated signs with a length of 7315 mm or less, the laminated panels shall be fabricated with no vertical joints, splices or seams. For signs with a length of greater than 7315 mm, the length of each adjoining panel shall be as determined by the Engineer or as shown on the plans.

The perimeter frame of Type A overhead laminated panels shall be connected by self-tapping hex head stainless steel screws. Sealant shall be placed at the corners of the perimeter frame to prevent moisture penetration. The perimeter frame of Type A panels shall consist of extruded channel edges on the vertical sides and consist of modified "H" section extrusion on the horizontal sides. The modified "H" section extrusion acts as an integral retainer track for affixing the bolts to provide blind fastening of panels to the structure support.

The Contractor shall furnish mounting hardware for overhead laminated panel signs, such as closure H-sections, clamps, bolts, nuts, and washers. The clamps shall be cast aluminum alloy with a minimum tensile strength of 170 MPa. Bolt torque used for installing clamps shall not exceed 12 N-m.

MEASUREMENT AND PAYMENT

Furnishing signs (except for construction area signs) will be measured by the square meter to the nearest 0.10-square meters, of the sign panel types installed in place.

Installation of sign panels will be measured and paid for as per Sections 56-2.05, "Measurement," and 56-2.06, "Payment," of the Standard Specifications except all references to State-furnished materials is deleted.

The contract price paid per square meter 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, including removable sign panel frame 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 meter for furnish sign of the various types and no separate payment will be made therefor.

10-1.74 INSTALL ROADSIDE SIGN PANEL ON EXISTING POST

Installing sign panels on existing posts shall be installed in conformance with the details shown on the plans, as per Section 56-2.04 of the Standard Specifications or as directed by the Engineer.

The contract unit price paid for install roadside sign panel on existing post shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in install roadside sign panel on existing post, 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 INSTALL SIGN PANEL ON EXISTING SIGN STRUCTURE

Sign panels shall be installed on existing sign structure at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-1.06, "Sign Panels and Fastening Hardware," of the Standard Specifications and these special provisions.

The Contractor shall furnish sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Existing sign panels, as shown on the plans, shall be removed and salvaged or removed and disposed of as provided in Section 15, "Existing Highway Facilities," of the Standard Specifications.

Installing sign panels on existing sign structure will be measured by the square meter and the quantity to be paid for will be the total area, in square meters, of sign panels installed in place.

The contract price paid per square meter for install sign panel on existing sign structure shall include full compensation for furnishing all labor, materials tools, equipment, and incidentals, and for doing all the work involved in installing sign panels on existing sign structure, complete in place (including removing and disposing of existing sign panels), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.76 ALTERNATIVE PIPE

Alternative pipe culverts shall conform to the provisions in Section 62, "Alternative Culverts," of the Standard Specifications and these special provisions.

Concrete backfill for alternative culverts shall be constructed in conformance with the provisions in Section 66-1.045, "Concrete Backfill," of the Standard Specifications and will be measured and paid for in conformance with the provisions in Section 66-4, "Measurement and Payment," of the Standard Specifications and the following:

- A. The quantity of concrete backfill to be paid for, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of corrugated steel pipe, except that when reinforced concrete pipe is designated as the only kind of culvert allowed for the installation of an alternative culvert, the quantity of concrete backfill to be paid for at that installation, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of reinforced concrete pipe with the least wall thickness shown in AASHTO Designation: M 170M for the Class of pipe designated.

10-1.77 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.

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 1.2 m or one half of the outside diameter of the pipe.

When reinforced concrete pipe is installed in conformance with the details shown on Standard Plan A62DA, the fifth paragraph of Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications shall not apply.

When solid rock or other unyielding material is encountered at the planned elevation of the bottom of the bedding, the material below the bottom of the bedding shall be removed to a depth of 1/50 of the height of the embankment over the top of the culvert, but not less than 150 mm nor more than 300 mm. The resulting trench below the bottom of the bedding shall be backfilled with structure backfill material in conformance with the provisions in Section 19-3.06, "Structure Backfill," of the Standard Specifications.

The excavation and backfill below the planned elevation of the bottom of the bedding will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Outer Bedding shown on Standard Plan A62DA shall not be compacted prior to placement of the pipe.

10-1.78 CORRUGATED STEEL PIPE

Corrugated steel pipe and pipe arch culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.

Corrugated steel pipe and pipe arch shall be fabricated from zinc-coated steel sheet.

10-1.79 EDGE DRAIN

Edge drains shall conform to the provisions in Section 68-3, "Edge Drains," of the Standard Specifications.

10-1.80 MISCELLANEOUS FACILITIES

Steel pipe risers, alternative flared end sections, precast concrete pipe riser, and alternative pipe risers shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications.

10-1.81 DRAINAGE INLET MARKER

The Contractor shall furnish and install thermoplastic drainage inlet markers in conformance with the details and locations shown on the plans, as specified in these special provisions, and as directed by the Engineer.

The Contractor shall furnish a Certificate of Compliance to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for plastic and thermoplastic drainage inlet markers. In addition, samples of each type of drainage inlet marker shall be submitted to the Engineer 10 days before placement of the markers.

Thermoplastic drainage inlet markers shall be prefabricated, free of lead and chromium, and conform to AASHTO Designation: M249-79 and the requirements as follow. Thermoplastic drainage inlet markers shall be adhered to the surface of the drainage inlet with adhesives or heat as recommended by the manufacturer of the marker.

| Property | Specifications | Requirements |
|-----------------------------------|------------------------------|-------------------------------------------|
| Thickness, mm | | 2.0 – 4.0 |
| Legend color (non-reflective) | FHWA's Color Tolerance Chart | Blue or Green
(PR Color Number 3 or 4) |
| Background color (non-reflective) | AASHTO Designation: M249-78 | White |
| Skid Resistance | ASTM Designation: E-303 | 60 BPN |

The Contractor shall mechanically clean the surface before placing thermoplastic drainage inlet markers.

Drainage inlet marker will be measured as units determined from actual count in place.

The contract unit price paid for drainage inlet marker shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing drainage inlet markers, complete in place, as shown on the plans, as specified in the Standard Specifications, and these special provisions, and as directed by the Engineer.

10-1.82 GRATED LINE DRAIN

This work shall consist of furnishing and installing precast grated line drain and grated line drain (with extensions), with necessary fittings, coupling systems, frames, grates and associated items as shown on the plans and in conformance with these special provisions.

The Contractor shall install grated line drain (with extensions) in the presence of the manufacturer's representative.

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. Sidewall extensions, including the double-wall extensions, shall be comprised of one piece. They shall be maintained in straight vertical alignment by use of temporary spacers or blocks until setting of the concrete backfill. Horizontal alignment shall be maintained as shown on the plans.

Monolithic polymer concrete shall be made from a composition of aggregate and polyester resin or vinyl ester resin and shall have the following properties when tested as follows:

| PROPERTY | ASTM
TEST METHOD | VALUE |
|-----------------------------------------------|---------------------|-----------|
| Tensile Strength, MPa | C 307 | 10 min. |
| Compressive Strength, MPa | C 579 | 80 min. |
| Bending Strength, MPa | C 580 | 20 min. |
| Moisture Absorption, % | C 140 | 0.5 max. |
| Chemical Resistance | C 267 | Pass |
| Freeze/Thaw, number of cycles w/o weight loss | C 666 | 1600 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 (112 kN 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 10 kN per meter of length of grated line drain frame is maintained.

Grates and frames shall be one piece or the grates shall be removable. Removable grates shall be held in place by locking devices that are tamper resistant. Removable grates shall provide a minimum repetitive pullout resistance of 5 kN per meter of length after completion of 1000 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 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 50 mm 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, except that minor concrete shall contain not less than 300 kg of cement per cubic meter.

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, prior to 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 and grated line drain (with extensions) to be paid for will be the length measured by the meter along the pavement surface as designated by the Engineer. No payment will be made for grated line drain and grated line drain (with extensions) placed in excess of the designated length.

The contract price paid per meter for grated line drain and grated line drain (with extensions), 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 and grated line drain (with extensions), complete in place, including excavation and backfill, connecting grated line drains and grated line drain (with extensions) 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.

10-1.83 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type A or Type B, at the option of the Contractor.

10-1.84 MISCELLANEOUS CONCRETE CONSTRUCTION

Gutters, curb, sidewalk, curb ramp and textured paving shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

MINOR CONCRETE (GUTTER)

Minor concrete (gutter) will be measured and paid for by the meter.

The contract price paid per meter for minor concrete (gutter) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the gutter, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

MINOR CONCRETE (CURB, SIDEWALK, AND CURB RAMP)

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps in conformance with the details shown on the plans and these special provisions. At the option of the Contractor, the detectable warning surface shall be prefabricated, cast-in-place, or stamped into the surface of the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard 595B, Color No. 33538.

Prefabricated detectable warning surface shall be in conformance with the requirements established by the Department of General Services, Division of State Architect and be attached in conformance with the manufacturer's recommendations.

Cast-in-place and stamped detectable warning surfaces shall be painted in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

The finished surfaces of the detectable warning surface shall be free from blemishes.

Prior to constructing the cast-in-place or stamping the detectable warning surface, the Contractor shall demonstrate the ability to produce a detectable warning surface conforming to the details shown on the plans and these special provisions by constructing a 600-mm by 600-mm test panel.

The manufacturer shall provide a written 5-year warranty for prefabricated detectable warning surfaces, guaranteeing replacement when there is defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period shall begin upon acceptance of the contract.

Full compensation for constructing or furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (curb, sidewalk, and curb ramp) and no separate payment will be made therefor.

If the Contractor elects to use the curing compound method for curing concrete for minor concrete (curb, sidewalk and curb ramp), the curing compound shall be curing compound (6) conforming to the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

The curing compound shall be applied in a manner that will provide a complete coating of all exposed faces of the concrete surface.

MINOR CONCRETE (TEXTURED PAVING)

Minor concrete (textured paving) is required at concrete surfaces shown on the plans.

Attention is directed to "Earthwork," of these special provisions.

The minor concrete (textured paving) shall consist of concrete with an exposed aggregate finish. The concrete shall have a color closely resembling "San Diego Buff," Davis manufacturer No. 5237. Color shall be integral, chemically inert, fade resistant mineral oxide or synthetic type.

TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on minor concrete (textured paving) (gore paving) to demonstrate the textured paving, including color hardener, curing and finishing compounds, and shall be submitted to the Engineer for written approval.

Minor concrete (textured paving) shall not be placed on the project prior to written approval by the Engineer of the samples prepared and submitted by the Contractor. In the event more than one test panel of textured paving to be placed is required by the Engineer, each additional test panel will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Reinforcing bar, of the size and type shown on the plans and conforming to the provisions in Section 52, "Reinforcement," of the Standard Specifications, shall be placed in the textured paving areas as shown on the plans.

Areas of minor concrete (textured paving) shown on the plans shall be constructed and finished in conformance with the following requirements:

- A. Coarse aggregate shall conform to the provisions for 25-mm x 4.75-mm primary size coarse aggregate in Section 90-3.02, "Coarse Aggregate Grading," of the Standard Specifications.
- B. Shotcrete shall not be used for the construction of the exposed aggregate concrete.
- C. Coarse aggregates shall be exposed to a depth of approximately 5 mm to 10 mm. Exposed aggregate surfaces shall be uniform in appearance.
- D. At the option of the Contractor, a concrete set retarder may be applied to the surface of the concrete after placing, consolidating, and finishing of the concrete has been completed. The concrete set retarder shall be commercial quality, manufactured specifically for use on the top surface of concrete and shall be applied in accordance with the manufacturer's recommendations. The retarder shall effectively retard the setting time of the cement and fine aggregate matrix deep enough and long enough to permit exposing the aggregates.
- E. Care shall be taken in placing and consolidating the concrete such that the coarse aggregate remains uniformly distributed throughout the concrete.
- F. When the mass of the concrete has set sufficiently to permit removing the matrix of cement and fine aggregate, the coarse aggregate shall be exposed with a water spray, coarse brooming, abrasive blasting, or a combination of these procedures. Removal methods shall not dislodge or loosen the coarse aggregate from embedment in the cement mortar.
- G. Immediately after the cement mortar has hardened sufficiently to resist further removal, all cement film and other loose material shall be cleaned from the exposed aggregate and all other surfaces with still brooms and water.
- H. Except when operations for exposing the aggregate are underway, concrete shall be cured by the water method or with Type (6) curing compound in conformance with the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications. Areas of concrete where curing compounds are removed during the cure period shall be kept continuously wet until the end of the cure period or until the curing compound is replaced.

For payment purposes, the area in square meters of minor concrete (textured paving) will be determined from horizontal measurements of the finished textured paving.

The contract price paid per square meter for minor concrete (textured paving) shall include full compensation for furnishing all labor, materials (including reinforcing bars), tools, equipment, and incidentals, and for doing all the work involved in constructing textured paving, including grouted areas, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.85 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

10-1.86 MISCELLANEOUS METAL (BRIDGE)

Miscellaneous metal (bridge) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" of these special provisions.

Miscellaneous metal (bridge) shall consist of the miscellaneous bridge metal items listed in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and the following:

A. Parapet cover.

Chain link fabric and tension rods shall conform to the provisions in Section 80-4, "Chain Link Fence," of the Standard Specifications.

10-1.87 BRIDGE DECK DRAINAGE SYSTEM

Bridge deck drainage systems shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Self-tapping screws used for sleeve connections shall be hex-head stainless steel, installed in holes drilled to fit the self-tapping screws, conforming to the requirements of ASTM Designation: A 276, Type 304.

At the Contractor's option, fiberglass pipes and fittings with the same diameter and minimum bend radius as those shown on the plans, may be substituted for welded steel pipe in deck drain systems.

Fiberglass pipe and fittings shall conform to the requirements in ASTM Designation: D 2996, and shall have a minimum short-term rupture strength of 207 MPa. The adhesive type recommended by the manufacturer shall be used for joining pipe and fittings. Fiberglass pipe not enclosed in a box girder cell or encased in concrete shall be manufactured from ultraviolet-resistant resin pigmented with concrete-gray color, or be coated with a concrete-gray resin-rich exterior coating. Paint shall not be used. Fiberglass pipe treated with ultraviolet protection shall withstand a minimum of 2500 hours of accelerated weathering when tested in conformance with the requirements in ASTM Designation: G 154. Lamps shall be UV-B (313 nm wavelength). The resting cycle shall be 4 hours of ultraviolet exposure at 60°C, and then 4 hours of condensate exposure at 50°C. After testing, the surface of the pipe shall exhibit no fiber exposure, crazing, or checking, and only a slight chalking or color change.

Support spacing for fiberglass pipe shall be the same as shown on the plans for welded steel pipe. Pipe supports shall have a width of not less than 38 mm.

A Certificate of Compliance for fiberglass pipe and fittings shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall include all laboratory test results conforming to the provisions specified herein.

For drainage piping NPS 8 or smaller, which is: (1) enclosed in a box girder cell and exposed for a length not greater than 6 m within the cell, or (2) encased in concrete, the Contractor shall have the option of substituting polyvinyl chloride (PVC) plastic pipe and fittings, with the same diameter and minimum bend radius as shown on the plans, for welded steel pipe.

The PVC plastic pipe and fittings shall be Schedule 40 conforming to the requirements of ASTM Designations: D 1785. The maximum support spacing for PVC plastic pipe shall be 2 m.

Couplings used to connect PVC plastic pipe or fiberglass pipe to steel shall be threaded or flanged.

If PVC plastic pipe or fiberglass pipe is substituted for welded steel pipe, the quantity of drainage piping will be computed on the basis of the dimensions and details shown on the plans, and no change in the quantities to be paid for will be made because of the use of PVC plastic pipe or fiberglass pipe.

Bridge deck drainage systems will be measured and paid for by the kilogram in the same manner specified for miscellaneous metal (bridge) in Section 75-1.06, "Measurement," and Section 75-1.07, "Payment," of the Standard Specifications.

Full compensation for modifying the existing bridge deck drainage system shall be considered as included in the contract price paid per kilogram for bridge deck drainage system and no additional compensations will be allowed therefor.

Full compensation for 200 mm cored hole shall be considered as included in the contract price paid per kilogram for bridge deck drainage system and no separate payment will be made therefor.

10-1.88 CHAIN LINK FENCE

Chain link fence shall be Type CL-1.8 and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications.

10-1.89 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.

Guard railing delineators shall be installed as shown on the plans.

Guard railing delineators shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Guard railing delineators will be measured by the unit determined from actual count of delineators used in the work or ordered by the Engineer.

The contract unit price paid for guard railing delineator shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in guard railing delineators, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.90 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.

Attention is directed to "Markers and Delineators" of these special provisions.

ALTERNATIVE FLARED TERMINAL SYSTEM

Alternative flared terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for a flared terminal system shall consist of one of the following or a Department approved equal.

- (1) TERMINAL SYSTEM (TYPE FLEAT) - Terminal system (Type FLEAT) shall be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type FLEAT) shown on the plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785-0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477-4800.
- (2) TERMINAL SYSTEM (TYPE SRT) - Terminal system (Type SRT) shall be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type SRT) shown on the plans. The SRT-350 Slotted Rail Terminal (8-post system) 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 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type SRT), 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 100 mm 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 65°C 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 FLEAT), 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 100 mm 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 65°C 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 flared 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 flared 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.

10-1.91 CABLE RAILING

Cable railing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

10-1.92 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Concrete barrier markers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. At those locations shown on the plans, concrete barrier markers shall be cemented to the barrier in conformance with the manufacturer's recommendations.

10-1.93 CONCRETE BARRIER (TYPE K)

Concrete barrier (Type K) shall consist of precast units conforming to the provisions for temporary railing (Type K) in Section 12-3.08, "Temporary Railing (Type K)," of the Standard Specifications, subject to the following conditions:

- A. Concrete barrier (Type K) shall be new precast units and shall remain in place at the completion of the contract.
- B. Removable panels shall not be used.
- C. Temporary railing (Type K) that are new precast units and have not been used on another project, may be used as concrete barrier (Type K) for this project provided the units are undamaged.
- D. New precast units that have been damaged and repaired during this shall be replaced with new units prior to completion of the contract unless otherwise approved in writing by the Engineer.

Temporary railing (Type K) reflectors on concrete barrier (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. When Concrete barrier (Type K) is placed in the median the spacing of barrier reflectors shall be placed to match spacing of raised pavement markers on the adjacent median edgeline pavement delineation.

Full compensation for furnishing and installing temporary railing (Type K) reflectors on concrete barrier (Type K) shall be considered as included in the contract price paid per meter for concrete barrier (Type K) and no additional compensation will be allowed therefor.

10-1.94 THRIE BEAM BARRIER

Thrie beam barrier shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work" of these special provisions.

10-1.95 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.

10-1.96 CRASH CUSHION (REACT)

Crash cushion (REACT) shall be furnished and installed as shown on the plans and in conformance with the provisions in the Standard Specifications and these special provisions.

Crash cushion (REACT) shall be a multiple recoverable type, manufactured by Energy Absorption Systems, Inc. Crash cushion (REACT) and additional components shall conform to the descriptions as follows:

| Contract Item Description | Manufacturer's Product Description |
|----------------------------|------------------------------------|
| Crash Cushion (REACT 9CBB) | REACT 350.9 Concrete Side Mount |

The successful bidder can obtain from the following distributors the crash cushion (REACT) manufactured by Energy Absorption Systems, Inc. at 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:

1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501

The price quoted by the manufacturer for Crash Cushion (REACT 9CBB), FOB Pell City, Alabama is \$35,502.00, not including sales tax.

The above prices will be firm for orders placed within 30 days of contract award, and provided delivery is accepted within 90 days after the order is placed.

The price quoted for crash cushion (REACT 9CBB) includes the concrete anchorage devices, but does not include the concrete anchor slab or the concrete backup block.

Crash cushion shall be installed in conformance with the manufacturer's recommendations.

Concrete anchorage devices used for attaching the crash cushion to the base slab shall be limited to those which have been provided by the manufacturer.

The concrete anchor slab and backup block shall conform to the provisions in Section 51, "Concrete Structures," and Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The concrete anchor slab and backup block shall be constructed of concrete containing not less than 350 kg of cementitious material per cubic meter.

The Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list for each model installed.

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 conforms with the contract plans and specifications, and conforms to the prequalified design and material requirements.

Crash cushion will be measured by the unit as determined from actual count in place in the completed work.

The contract unit prices paid for crash cushion (REACT 9CBB) shall include full compensation for furnishing all labor, materials (including anchor bolts, nuts, washers, and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the crash cushions, complete in place, including structure excavation, structure backfill, and concrete anchor slab and backup block with bar reinforcing steel, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.97 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic traffic stripes (traffic lines) and pavement markings, including traffic stripes and pavement markings shown on the stage construction and traffic handling sheets of the plans, shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Attention is directed to "Order Of Work" of these special provisions.

Traffic stripe and pavement markings placed as shown on the stage construction and traffic handling sheets of the plans shall be removed when no longer required for traffic handling as determined by the Engineer

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 250 mcd·m⁻²·lx⁻¹. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 mcd·m⁻²·lx⁻¹.

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 traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

| Minimum
Stripe Thickness
(mm) | Minimum
Application Rate
(kg/m) |
|-------------------------------------|---------------------------------------|
| 2.5 | 0.5 |

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

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 thermoplastic traffic stripes and 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 traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

10-1.98 PAINT TRAFFIC STRIPE AND PAVEMENT MARKING

Painted traffic stripes (traffic lines) and pavement markings, including traffic stripes shown on the stage construction and traffic handling sheets of the plans, shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Attention is directed to "Order Of Work" and "Temporary Pavement Delineation" of these special provisions

Traffic stripe placed as shown on the stage construction and traffic handling sheets of the plans shall be removed when no longer required for traffic handling as determined by the Engineer.

Traffic stripe and pavement marking paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the painted traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6628-01.

Retroreflectivity of the paint traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White painted traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 250 mcd·m⁻²·lx⁻¹. Yellow painted traffic stripes and pavement markings shall have a minimum initial retroreflectivity of 150 mcd·m⁻²·lx⁻¹.

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 painted traffic stripes and pavement markings. Permanent tape, if used, shall be placed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of painted traffic stripes and pavement markings, the tape will be measured and paid for by the meter as paint traffic stripe and by the square meter as paint pavement marking of the number of coats designated in the Engineer's Estimate.

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.

Double traffic stripes, consisting of one 100-mm wide yellow or white stripe adjacent to one 100-mm wide black stripe, will be measured as one traffic stripe.

10-1.99 PAVEMENT MARKERS

Pavement markers, including pavement markers shown on the stage construction and traffic handling sheets of the plans, 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 "Remove Pavement Markers" of these special provisions regarding removal of pavement markers shown on the stage construction and traffic handling sheets of the plans.

The sixth paragraph of Section 85-1.06, "Placement," of the Standard Specifications shall not apply to the pavement markers shown on the stage construction and traffic handling sheets of the plans.

Epoxy adhesive shall not be used to place pavement markers as shown on the stage construction and traffic handling sheets in areas where removal of the markers will be required.

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.

The Contractor shall notify the Engineer not less than 72 hours prior to requiring initial access to the existing irrigation controllers. When the Engineer determines that access to the controllers is required at other times, arrangements will be made to provide this access.

COST BREAK-DOWN

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum item of irrigation system. The cost break-down table shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. The cost break-down table will be approved, in writing, by the Engineer before any partial payment will be made for the item of irrigation system.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

The cost break-down shall be completed and furnished in the format shown in the sample of the cost break-down 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 line item descriptions shown in the samples. The line items and quantities given in the sample are to show the manner of preparing the cost break-down 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-down submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted for approval.

The sum of the amounts for the line items of work listed in the cost break-down table for irrigation system work shall be equal to the contract lump sum price bid for the work. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in the cost break-down table.

No adjustment in compensation will be made in the contract lump sum price paid for irrigation system due to differences between the quantities shown in the cost break-down table 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 table 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 item of irrigation system due to changes in line items of work ordered by the Engineer. When the total value of ordered changes to line items of work increases or decreases the lump sum price bid for irrigation system by more than 25 percent, the adjustment in compensation 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.

IRRIGATION SYSTEM COST BREAK-DOWN

Contract No. 11-2T0914

| UNIT DESCRIPTION | UNIT | APPROXIMATE QUANTITY | VALUE | AMOUNT |
|-----------------------------------------------------|------|----------------------|-------|--------|
| CHECK AND TEST EXISTING IRRIGATION FACILITIES | LS | LUMP SUM | | |
| REMOVE EXISTING IRRIGATION FACILITIES | LS | LUMP SUM | | |
| RELOCATE EXISTING IRRIGATION FACILITIES | LS | LUMP SUM | | |
| CONTROL AND NEUTRAL CONDUCTORS | LS | LUMP SUM | | |
| 25 MM PLASTIC PIPE (PR-200) (SUPPLY LINE) (LATERAL) | M | 110 | | |
| 32 MM PLASTIC PIPE (PR-200) (SUPPLY LINE) (LATERAL) | M | 80 | | |
| 40 MM PLASTIC PIPE (PR-200) (SUPPLY LINE) (LATERAL) | M | 100 | | |
| 75 MM PLASTIC PIPE (PR-200) (SUPPLY LINE) (MAIN) | M | 1420 | | |
| 250 MM PLASTIC PIPE (PR-250) (SUPPLY LINE) (MAIN) | M | 350 | | |
| 25 MM REMOTE CONTROL VALVE | EA | 3 | | |
| 40 MM REMOTE CONTROL VALVE | EA | 1 | | |
| 25 MM GATE VALVE | EA | 3 | | |
| 40 MM GATE VALVE | EA | 1 | | |
| 75 MM GATE VALVE | EA | 2 | | |
| TRACER WIRE | LS | LUMP SUM | | |
| RECYCLED WATER WARNING SIGNS | LS | LUMP SUM | | |
| | | | | |
| | | | | |
| | | | | |

TOTAL _____

10-2.02 (BLANK)

10-2.03 EXISTING HIGHWAY IRRIGATION FACILITIES

The work performed in connection with the various existing highway irrigation system facilities shall conform to the provisions in "Existing Highway Facilities," of these special provisions.

Water shall be maintained in conformance with the provisions in Section 20-5.025, "Maintain Existing Water Supply," of the Standard Specifications.

LOCATE EXISTING CROSSOVERS AND CONDUITS

Existing crossovers and conduits shown on the plans to be incorporated in the new work shall be located in conformance with the provisions for locating conduits in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Unless otherwise directed by the Engineer, existing crossovers and conduits shown on the plans to be incorporated in the new work shall be located prior to performing work on irrigation systems.

If debris is encountered in the ends of conduits, the debris shall be removed prior to performing other work in the conduits. Removal of debris within the first one meter in these conduits shall be at the Contractor's expense. If debris is encountered in the conduits more than one meter from the ends of the conduits, the additional debris shall be removed as directed by the Engineer and the removal work will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

CHECK AND TEST EXISTING IRRIGATION FACILITIES

Existing irrigation facilities that are to remain or to be relocated, and that are within those areas where clearing and grubbing or earthwork operations are to be performed, shall be checked for missing or damaged components and proper operation prior to performing clearing and grubbing or earthwork operations. Existing irrigation facilities outside of work areas that are affected by the construction work shall also be checked for proper operation.

A written list of existing irrigation system deficiencies shall be submitted to the Engineer within 5 working days after checking the existing facilities.

Deficiencies found during checking of the existing facilities shall be corrected as directed by the Engineer. Corrective work ordered by the Engineer will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Length of watering cycles for use of recycled water from water meters for checking or testing existing irrigation facilities shall be as determined by the Engineer.

REMOVE EXISTING IRRIGATION FACILITIES

Existing irrigation facilities where shown on the plans to be removed, shall be removed. Facilities that are more than 150 mm below finished grade, excluding facilities to be salvaged, may be abandoned in place.

Immediately after disconnecting an existing irrigation facility to be removed or abandoned from an existing facility to remain, the remaining facility shall be capped or plugged, or shall be connected to a new or existing irrigation facility.

Existing remote control valves and gate valves, where shown on the plans to be removed, shall be salvaged.

The Engineer shall be given written notification of the intent to salvage existing irrigation facilities a minimum of 72 hours prior to salvaging these facilities.

Salvaged irrigation facilities shall remain the property of the State and shall be delivered to the Engineer.

A list of salvaged facilities, including the quantity and size of each item salvaged, shall be included with each delivery.

Facilities to be removed, excluding facilities to be salvaged, 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.

RELOCATE EXISTING IRRIGATION FACILITIES

Relocate existing irrigation facilities shall consist of relocating existing irrigation controllers, controller enclosure cabinets, and other facilities shown on the plans or specified in these special provisions.

Relocate existing irrigation controllers shall consist of relocating the existing controllers and controller enclosure cabinets; constructing concrete pads; and furnishing and installing anchor bolts, electrical conduits, including control and neutral conductors and electrical power conductors. Conduits for control and neutral conductors and electrical power conductors shall terminate in separate new or relocated pull boxes located within 1.5 m of the new concrete pads.

Existing irrigation facilities, shown on the plans to be relocated, that are, in the opinion of the Engineer, unsuitable for the purpose intended, shall be replaced in conformance with the provisions in Section 15-2.05, "Reconstruction," of the Standard Specifications.

After irrigation facilities have been relocated, the Contractor shall demonstrate that the relocated facilities function properly in the presence of the Engineer.

10-2.04 (BLANK)

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.

Attention is directed to the provisions in "Obstructions" of these special provisions, regarding work over or adjacent to existing underground facilities. Excavation for proposed irrigation facilities shall not be started until the existing underground facilities have been located.

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 35 kPa 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 35 kPa or less.

Only pipeline trenches and excavation pits for supply lines being supplied from one water service point shall be open at one time. After pressure testing is complete, trenches and pits excavated for pipe supply lines, being supplied from one water service point, shall be backfilled prior to commencing excavations for pipe supply lines being supplied from another water service point.

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.

Fiberglass or reinforced plastic valve boxes shall be purple in color and fabricated for use with recycled water.

Valve boxes shall not have side openings unless otherwise shown on the plans.

Covers for concrete valve boxes shall be glass fiber reinforced plastic, or plastic, and shall be purple in color and fabricated for use with recycled water.

Covers for plastic valve boxes shall be glass fiber reinforced plastic or plastic, and shall be purple in color and fabricated for use with recycled water.

Valve boxes with plastic covers shall be identified on the top surface of the covers by branding the appropriate abbreviations for the irrigation facilities contained in the valve boxes 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). The letters and numbers shall be 50 mm in height.

Valve boxes with glass fiber reinforced plastic covers 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.

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, 75 mm and larger in size, shall be furnished with a square nut and 3 long shank keys that will operate the valve.

Gate valves, 75 mm and larger in size, shall be flanged type gate valves. Pipe flanges used to connect plastic or metal pipe to gate valves shall be plastic or metal.

Gate valves shall have a solid bronze or brass wedge.

ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

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, brass, or bronze construction.
- B. Valves shall be angle pattern (bottom inlet) or straight pattern (side inlet) as shown on the plans.

- C. Valves shall be equipped with a self-flushing feature manufactured to be used with recycled water. Valves shall not have external tubing.
- D. Electric remote control valves shall have manual external and internal bleed capability.
- E. Valve solenoids shall be one piece with plunger and spring secured to the solenoid.

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.

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 shall be marked with adhesive backed paper markers or adhesive cloth wrap-around markers, with clear, heat-shrinkable sleeves sealed over the markers.
- B. Non-spliced conductors in pull boxes and valve boxes shall be marked with clip-on, "C" shaped, white extruded polyvinyl chloride sleeves. Marker sleeves shall have black, indented legends of uniform depth with transparent overlays over the legends and "chevron" cuts for alignment of 2 or more sleeves.

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.

New control and neutral conductors that are to replace existing control and neutral conductors shall be the same size and color as the existing control and neutral conductors being connected to.

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 1.05 mm for wire sizes 10AWG and smaller.

PIPE

Plastic Pipe

Plastic pipe supply lines shall be polyvinyl chloride (PVC) pipe conforming to the requirements in "Recycled Water Supply Lines" of these special provisions.

Plastic pipe supply lines and fittings that are 75 mm or larger in diameter on the supply side of control valves shall be the rubber ring gasket type, except when pressure rating (PR) 315 plastic pipe supply line is required.

Plastic pipe supply lines less than 75 mm in diameter shall have solvent cemented type joints. Primers shall be used on the solvent cemented type joints.

Plastic pipe supply lines (main) shall have a minimum cover of 0.45 m.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 shall be Schedule 80.

Recycled Water Supply Lines

New and exposed recycled water supply lines shall be purple colored polyvinyl chloride (PVC).

Purple colored PVC supply lines shall conform to the following:

- A. Pipe shall be made of PVC 1120 with the minimum pressure ratings (PR) shown on the plans.
- B. Pipe shall conform to the requirements in one of the following Standards: ASTM Designation: D 1785, ASTM Designation: D 3139 and ASTM Designation: D 2241 or ASTM Designation: D 2672.
- C. Pipe shall have permanent wording "CAUTION RECYCLED WATER" in 2 rows, approximately 180 degrees apart, in the longitudinal direction of the pipe. The warning message shall be repeated every 600 mm continuously along the pipe.

Tracer Wire

Tracer wire shall be used on 75 mm and 250 mm recycled water mains for the purpose of providing a continuous signal path used to determine pipe alignment after installation.

Tracer wire shall be #14 AWG solid copper UF type wire with cross-linked polyethylene insulation. The insulation shall be white or yellow in color.

Wire shall be placed on the top centerline of the pipeline and shall run continuously along the entire length of pipe prior to placement of trench backfill.

Tracer wire shall be secured to the pipe at 1.8m intervals with plastic adhesive tape, duct tape or plastic tie straps.

Tracer wire splices shall be installed only when necessary and shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduits and Pull Boxes," of the Standard Specifications.

THRUST BLOCK

Thrust blocks shall be installed in accordance with the plans and these special provisions. Thrust blocks shall be installed on the main supply line at all changes in direction and terminus run.

Concrete shall conform to the special provision in Section 20-2.26, "Concrete," of the Standard Specifications.

RECYCLED WATER WARNING SIGNS

Recycled water warning signs shall be furnished and installed at the locations shown on the plans, as specified in these special provisions, and as directed by the Engineer. Recycled water warning signs shall be affixed to the above ground irrigation facilities that use or are associated with recycled water.

Warning sign decals shall be commercially available, and shall include the following information: "Recycled Water, Do Not Drink" and the "Do Not Drink" drinking glass graphic symbol. Warning sign decals shall be UV fade resistant, purple in color with black text, manufactured from a flexible, vinyl based or flexible, vinyl based with mylar product. Warning sign decals shall be all-weather, self-adhesive with peel-off backs.

Aluminum sign plates shall be 1.6 mm thick aluminum.

Warning tags shall be purple, doubled sided, manufactured from polyurethane, incorporating an integral neck attachment and attachment hole. The attachment hole shall be capable of withstanding 81 kilograms of pull out resistance. Tag lettering shall be hot-stamped in black and capable of withstanding outdoor usage. Warning tags shall include the following information: "Recycled Water, Do Not Drink" and the "Do Not Drink" drinking glass graphic symbol.

Warning signs on above ground irrigation facilities shall be placed in visible locations.

Warning sign decals shall be applied directly to clean smooth surfaces. The smooth surfaces shall be cleaned with alcohol, or an equivalent cleaner, before applying the decals.

Warning sign decals or warning sign decals on aluminum sign plates shall be permanently affixed to irrigation controller enclosure cabinet.

A 100 mm x 100 mm warning sign decal shall be permanently affixed to irrigation controller enclosure cabinet doors. Decals for cabinets may be affixed to aluminum sign plates and the plates attached with commercial quality, cadmium plated, non-removable, self-tapping screws or commercial quality, cadmium plated bolts, nuts and washers.

Warning tags approximately 50 mm x 50 mm shall be attached to the remote control valves, remote control valves (master), inside the valve box in accordance with the manufacturers recommendations.

Marking underground pipe for recycled water shall conform to the provisions in "Pipe" of these special provisions.

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 using recycled water measured by water meters for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to existing and relocated 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 prices paid for the various contract items of irrigation systems involved and no additional compensation will be allowed therefor.

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Traffic signal and lighting, lighting and sign illumination, temporary lighting, temporary ramp metering systems, temporary traffic monitoring station, traffic management system (TMS) ramp metering systems, traffic monitoring stations, fiber optic communication system, temporary communication system, changeable message sign system, HOV reversible lane system and remove and maintain toll booth services, maintaining traffic management system elements during construction shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Traffic monitoring installations are shown at the following locations:

- A. Location 1- Route 15 northbound and southbound at Station 181+70 "SD15B".
- B. Location 2- Route 15 northbound and southbound at Station 189+60 "SD15B".
- C. Location 3- Route 15 southbound at Station 201+00 "SD15ML".
- D. Location 4- Route 15 northbound and southbound at Station 211+05 "SD15ML".
- E. Location 5- Route 15 northbound and southbound at Station 218+30 "SD15ML".

Lighting equipment is included in the following structures:

- A. Retaining Wall No. "ML202R".
- B. Retaining Wall No. "ML205L".

Traffic signal work shall be performed at the following locations:

- A. Location 1 - Route 15 Northbound ramps at Pomerado Road.
- B. Location 2 - Route 15 Southbound ramps at Miramar Road.

Ramp Metering work shall be performed at the following locations:

- A. Location 1 - Route 15 Southbound on ramp at Miramar way.
- B. Location 2 - Route 15 Southbound on ramp at (EB) Miramar Road.
- C. Location 3 - Route 15 Southbound on ramp (WB) Miramar Road.
- D. Location 4 - Route 15 Northbound on ramp (EB) at Pomerado Road.
- E. Location 5 - Route 15 Northbound on ramp (WB) at Pomerado Road.

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 30 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 breakdown shall include the following items in addition to those listed in the Standard Specifications:

Attention is directed to "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.

The sum of the amounts for the line items of work listed in each cost break-down table below for electrical work shall be equal to the contract lump sum price bid for each lump sum electrical item. 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.

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 items within the cost breakdowns of for each lump sum electrical item due to changes ordered by the Engineer. When the ordered changes to line items of work increases or decreases by more than 25 percent, the adjustment in compensation for the applicable cost breakdown 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.

The following are the quantity break-downs for the contract lump sum items of signals, lighting and electrical systems. The quantity break-downs are included in these special provisions for the Contractor to use for bidding purposes in the absence of signed electrical plans. Final signals, lighting and electrical systems plans will be completed 30 days after the contract has been approved.

The following quantity break-downs for contract lump sum items for signals, lighting and electrical systems shall be provided by the Contractor:

1. Lighting and Sign Illumination along Route 15 between stations 180+00 "SD15B" and 255+00 "SD15ML". Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| LIGHTING AND SIGN ILLUMINATION | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|---------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Lighting standards with foundation | 35, 36 | EA | 32 | | |
| | 15 | EA | 2 | | |
| | 15D | EA | 4 | | |
| | Relocated 35, 36 | EA | 10 | | |
| | | | | | |
| Luminaires | ISL (85W) Sign | EA | 48 | | |
| | 200W HPS | EA | 2 | | |
| | 310W-HPS | EA | 50 | | |
| | | | | | |
| Pull Boxes | 9 or 9A | EA | 16 | | |
| | No. 5 or 6 | EA | 40 | | |
| | No. 5(T) or 6(T) | EA | 50 | | |
| | | | | | |
| Conduit (m) | 53C(trench) | M | 4400 | | |
| | 53C(barrier) | M | 600 | | |
| | 53C(Jacking/Drilling) | M | 1150 | | |
| | 78C | M | 100 | | |
| | | | | | |
| Conductors (m) | #2 | M | 1000 | | |
| | #4 | M | 1000 | | |
| | #6 | M | 6000 | | |
| | #8 | M | 2000 | | |
| | #10 | M | 1000 | | |
| | #14 | M | 1000 | | |
| | | | | | |
| Service Cabinet with foundation | Type III-BF | EA | 1 | | |
| | Type III-CF | EA | 1 | | |
| Miscellaneous | Connect CEC | EA | 2 | | |
| | Sign Control (SC3) | EA | 14 | | |
| | Expansion conduit X | EA | 30 | | |
| | | | | | |
| | | | TOTAL | | |

4. Ramp metering system (location 3) on Route 15 Southbound on ramp (WB) Miramar Road. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| RAMP METERING SYSTEM (LOCATION 3) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Pull Boxes | No. 5 or 6 | EA | 8 | | |
| | No. 5(T) or 6(T) | EA | 2 | | |
| Detectors | Loops | EA | 2 | | |
| Conductors | DLC | M | 400 | | |
| | OCC | M | 200 | | |
| Conduit | 53C | M | 300 | | |
| | | | TOTAL | | |

5. Ramp metering system (location 4) on Route 15 Northbound on ramp (EB) at Pomerado Road. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| RAMP METERING SYSTEM (LOCATION 4) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Relocate Poles with foundation | Type 15 (MVDS) | EA | 1 | | |
| Pull Boxes | No. 5 or 6 | EA | 8 | | |
| | No. 5(T) or 6(T) | EA | 2 | | |
| Detectors | Loops | EA | 10 | | |
| Conductors | DLC | M | 2400 | | |
| | OCC (reused) | M | 300 | | |
| Conduit | 53C | M | 300 | | |
| | | | TOTAL | | |

6. Ramp metering system (location 5) on Route 15 Northbound on ramp (WB) at Pomerado Road. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| RAMP METERING SYSTEM (LOCATION 5) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Relocate Poles with foundation | Type 15 (TS) | EA | 1 | | |
| | | | | | |
| Pull Boxes | No. 5 or 6 | EA | 2 | | |
| | | | | | |
| Conductors | 9CSC(reused) | M | 20 | | |
| | | | | | |
| Conduit | 53C | M | 20 | | |
| | | | | | |
| | | | TOTAL | | |

7. Traffic monitoring station (Location 1) on northbound and southbound Route 15 "SD15B" at Station 181+70. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| TRAFFIC MONITORING STATION (LOCATION 1) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Pull Boxes | No. 5 or 6 | EA | 4 | | |
| | No. 5(T) or 6(T) | EA | 4 | | |
| Detectors | RL MVDS | EA | 1 | | |
| | | | | | |
| Conduit | 53C (Jacking/Drilling) | M | 100 | | |
| | 53C | M | 100 | | |
| Conductors | MVDS cable | M | 60 | | |
| | DLC | M | 2400 | | |
| | | | | | |
| Pole with foundation | RL Type 15TS (MVDS) | EA | 1 | | |
| | | | | | |
| | | | TOTAL | | |

8. Traffic monitoring station (Location 2) on northbound and southbound Route 15 "SD15B" at Station 189+60. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| TRAFFIC MONITORING STATION (LOCATION 1) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Pull Boxes | No. 5 or 6 | EA | 4 | | |
| | No. 5(T) or 6(T) | EA | 4 | | |
| Detectors | RL MVDS | EA | 2 | | |
| | | | | | |
| Conduit | 53C (Jacking/Drilling) | M | 100 | | |
| | 53C | M | 200 | | |
| Conductors | MVDS cable | M | 300 | | |
| | | | | | |
| Pole with foundation | RL Type VDS 35 | EA | 2 | | |
| | | | | | |
| | | | TOTAL | | |

9. Traffic monitoring station (Location 3) on southbound Route 15 "SD15ML" from station 201+00. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| TRAFFIC MONITORING STATION (LOCATION 3) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Pull Boxes | No. 5 or 6 | EA | 4 | | |
| | No. 5(T) or 6(T) | EA | 4 | | |
| Detectors | RL MVDS | EA | 1 | | |
| | | | | | |
| Conduit | 53C (Jacking/Drilling) | M | 100 | | |
| | 53C | M | 100 | | |
| Conductors | MVDS cable | M | 160 | | |
| | DLC | M | 2400 | | |
| | | | | | |
| Pole with foundation | RL Type VDS 35 | EA | 1 | | |
| | | | | | |
| | | | TOTAL | | |

10. Traffic monitoring station (Location 4) on northbound and southbound Route 15 "SD15ML" from station 211+05. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| TRAFFIC MONITORING STATION (LOCATION 4) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Pull Boxes | No. 5 or 6 | EA | 4 | | |
| | No. 5(T) or 6(T) | EA | 4 | | |
| Detectors | MVDS | EA | 2 | | |
| | | | | | |
| Conduit | 53C (Jacking/Drilling) | M | 100 | | |
| | 53C | M | 100 | | |
| Conductors | MVDS cable | M | 200 | | |
| | | | | | |
| Pole with foundation | RL Type VDS 35 | EA | 1 | | |
| | | | | | |
| | | | | | |
| | | | TOTAL | | |

11. Traffic monitoring station (Location 5) on northbound and southbound Route 15 "SD15ML" from station 218+30. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| TRAFFIC MONITORING STATION (LOCATION 4) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|------------------------------------------------|-------------------------|-------------|-----------------|--------------|---------------|
| Pull Boxes | No. 5 or 6 | EA | 4 | | |
| | No. 5(T) or 6(T) | EA | 4 | | |
| | | | | | |
| Detectors | MVDS | EA | 2 | | |
| | RL MVDS | EA | 1 | | |
| | | | | | |
| Conduit | 53C (Jacking/Drilling) | M | 150 | | |
| | 53C | M | 100 | | |
| Conductors | MVDS cable | M | 250 | | |
| | | | | | |
| Pole with foundation | RL Type VDS 35 | EA | 1 | | |
| | | | | | |
| | | | | | |
| | | | TOTAL | | |

12. Signal and lighting (Location 1) on Route 15 Northbound ramps at Pomerado Road. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| SIGNAL AND LIGHTING
(LOCATION 1) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|---------------------------------------------|--------------------------------|-------------|-----------------|--------------|---------------|
| Signal Heads | SV-1-T | EA | 1 | | |
| | TV-1-T | EA | 1 | | |
| | MAS | EA | 1 | | |
| | MAT | EA | 1 | | |
| | SP-1-T | EA | 2 | | |
| | PPB | EA | 2 | | |
| | SV-2-T | EA | 1 | | |
| | | | | | |
| Signal standards with foundation | Type 1-A (2.4 m OR 3 m) | EA | 1 | | |
| | Type 27 | EA | 1 | | |
| | Type 15 | EA | 1 | | |
| | | | | | |
| Pull Box | No. 5 or 6 | EA | 13 | | |
| | | | | | |
| Detectors | Loops | | 16 | | |
| | | | | | |
| Video Detection | VDU | EA | 3 | | |
| | VIS | EA | 3 | | |
| | Video Display | EA | 1 | | |
| | Ethernet Communication card | EA | 1 | | |
| Conduits | Size 53 | M | 300 | | |
| | Size 103 | M | 200 | | |
| | | | | | |
| Conductors | #8 | M | 480 | | |
| | | | | | |
| Cables | DLC | M | 1500 | | |
| | 3CSC | M | 200 | | |
| | 12CSC | M | 600 | | |
| | OCC | M | 100 | | |
| | EVC | M | 200 | | |
| | Video Cable | M | 200 | | |
| | | | | | |
| Install Controller Cabinet and Foundation | SF Type 332 | EA | 1 | | |
| | | | | | |
| Luminaires | 310W HPS | EA | 3 | | |
| | | | | | |
| Miscellaneous | Install Detail U | EA | 1 | | |
| | RC PB | EA | 12 | | |
| | RS 1-A (3m) with Appurtenances | EA | 2 | | |
| | RS Exist 170 | EA | 1 | | |
| | | | | | |
| | | | TOTAL | | |

13. Signal and lighting (Location 2) on Route 15 Southbound ramps at Miramar Road. Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| SIGNAL AND LIGHTING
(LOCATION 2) | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|---------------------------------------------|--------------------------------------|-------------|-----------------|--------------|---------------|
| Signal Heads | SV-1-T | EA | 1 | | |
| | SV-2-T | EA | 2 | | |
| | TV-1-T | EA | 2 | | |
| | MAS | EA | 3 | | |
| | MAT | EA | 3 | | |
| | SP-1-T | EA | 2 | | |
| | PPB | EA | 2 | | |
| | | | | | |
| Signal standards with foundation | Type 1-A (2.4 m OR 3 m) | EA | 2 | | |
| | Type 26 | EA | 2 | | |
| | Type 27 | EA | 1 | | |
| | Type 15 | EA | 1 | | |
| | | | | | |
| Pull Box | No. 5 or 6 | EA | 12 | | |
| | | | | | |
| Detectors | Loops | EA | 12 | | |
| | | | | | |
| Video Detection | VDU | EA | 3 | | |
| | VIS | EA | 3 | | |
| | Video Display | EA | 1 | | |
| | Ethernet Communication card | EA | 1 | | |
| | | | | | |
| Conduits | Size 53 | M | 300 | | |
| | Size 103 | M | 200 | | |
| | | | | | |
| Conductors | #8 | M | 480 | | |
| | | | | | |
| Cables | DLC | M | 1,500 | | |
| | 3CSC | M | 200 | | |
| | 12CSC | M | 600 | | |
| | OCC | M | 100 | | |
| | EVC | M | 200 | | |
| | Video Cable | M | 200 | | |
| Install Controller Cabinet and Foundation | SF Type 332 | EA | 1 | | |
| Luminaires | 310W HPS | EA | 3 | | |
| Miscellaneous | Install Detail U | EA | 3 | | |
| | RC PB | EA | 17 | | |
| | RS Type 24 with Appurtenances | EA | 1 | | |
| | RS Type 26 with Appurtenances | EA | 1 | | |
| | RS Type 1-A (3 m) with Appurtenances | EA | 3 | | |
| | RS Type 170 | EA | 1 | | |
| | | | | | |
| | | | TOTAL | | |

14. Fiber Optic Communication System along Route 15 between stations 190+00 "SD15B" and 255+00 "SD15ML". Signed electrical plans will be provided to the Contractor detailing the location of measurable components as detailed in the following table.

| FIBER OPTIC COMMUNICATION SYSTEM | UNIT DESCRIPTION | UNIT | QUANTITY | PRICE | AMOUNT |
|-----------------------------------------|------------------------------|-------------|-----------------|--------------|---------------|
| Pull Box | 6(E)(T) | EA | 5 | | |
| | Vaults | EA | 10 | | |
| | | | | | |
| Conduits | MDCS (8)(trench) | M | 800 | | |
| | MDCS(8) (Jacking/Drilling) | M | 100 | | |
| | MVDS (2) (trench) | M | 600 | | |
| | | | | | |
| Conductors | FO12 | M | 1500 | | |
| | FO144 | M | 18000 | | |
| | CAMERA CABLE | M | 120 | | |
| Replace equipment | CCTV Camera | EA | 6 | | |
| Foundation Only | Type 334 (Reader/VTMS) | EA | 5 | | |
| | | | | | |
| Miscellaneous | Fiber Optic Splices | EA | 1600 | | |
| | Fiber Optic Splice Closures | EA | 10 | | |
| | FDU | EA | 10 | | |
| | SECU | EA | 10 | | |
| | Media Converter | EA | 12 | | |
| | Ethernet Extender Provider | EA | 6 | | |
| | Ethernet Switch | EA | 3 | | |
| | Ethernet Extender Subscriber | EA | 6 | | |
| FO Pigtail | SMFO SC Pigtails | EA | 500 | | |
| FO Jumper | Simplex SMFO SC/SC Jumper | EA | 20 | | |
| CU Jumper | CAT 5e Patch Cable | EA | 10 | | |
| CU Cable | Serial Data Cable | EA | 10 | | |
| | | | | | |
| | | | TOTAL | | |

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 4.8 kilometers
2. for a duration of up to 60 days on any continuous segment of the freeway/highway shorter than 4.8 kilometers

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 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 4-1.03D, "Extra Work," of the Standard Specifications.

Furnishing and installing temporary or portable TMS elements that are not shown on the plans, but are required to keep an existing TMS element operational, will be paid for as extra work as provided in Section 4-1.03D, "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 4-1.03D, "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 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.05 TEMPORARY LIGHTING

The temporary lighting shall consist of installing and maintaining temporary lighting in conformance with the details shown on the plans, the provisions in "Maintaining Traffic" of these special provisions, the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications, and these special provisions.

The provisions in this section shall not relieve the Contractor from the responsibility to provide the additional devices or take the measures as may be necessary to conform to the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

Other materials and equipment for a temporary lighting including, but not limited to, luminaires, wood poles, conductors, and hardware shall be furnished by the Contractor.

Materials and equipment to be used in the temporary lighting shall be either new or used suitable for the intended use.

CONDUCTORS AND WIRING

Conductors shall be the types specified in Section 86-2.08, "Conductors," of the Standard Specifications or shall be Type UF cable. Minimum conductor size shall be No. 12.

Conductors to be placed outside of paved areas shall be placed by one of the following methods:

- A. Direct burial method with Type UF cable installed at a minimum depth of 600 mm below grade.
- B. Placed in Type 1 conduit as shown on the plans.
- C. Suspended from wood poles with a minimum clearance at any point of 3 m. Conductors on the pole within 3 m above ground shall be enclosed in a Type 3 or Type 4 conduit.

BONDING AND GROUNDING

Standards with metal bases shall be mechanically and electrically secure to form a continuous system effectively grounded by the grounding conductor.

Generator neutral grounding shall conform to the provisions for multiple service points in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications.

SERVICE

The Contractor shall provide power for the temporary lighting as shown on the plans.

Materials and equipment shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way," of the Standard Specifications. Pole holes shall be backfilled.

Direct buried conductors, installed 300 mm or more below the ground surface, and conduit may be abandoned in place.

10-3.06 FOUNDATIONS

Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in "Piling" of these special provisions except for payment.

10-3.07 STANDARDS, STEEL PEDESTALS, AND POSTS

Standards, steel pedestals, and posts for traffic signal and lighting standards shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, "Steel Structures" of these special provisions, and the following requirements.

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.

The sign mounting hardware shall be installed at the locations shown on the plans.

Handhole reinforcement rings for standards, steel pedestals, and posts shall be continuous around the handholes.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

10-3.08 CONDUIT

Conduit to be installed underground shall be Type 3 unless otherwise specified.

Pull ropes for empty conduits for future use shall be a soft fiber type of not less than 12 mm diameter.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 3.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

| Size Designation for Metallic Type Conduit | Equivalent Size for Rigid Non-metallic Conduit |
|--------------------------------------------|------------------------------------------------|
| 21 | 20 |
| 27 | 25 |
| 41 | 40 |
| 53 | 50 |
| 63 | 65 |
| 78 | 75 |
| 103 | 100 |

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled to not less than 100 mm above the conduit with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 250 kg of cementitious material per cubic meter. The remaining trench shall be backfilled to finished grade with backfill material.

After conductors have been installed, the ends of conduits terminating in pull boxes, telephone demarcation, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications and with the details shown for "T" trench on ES-5D.

At the option of the Contractor, the final 0.6-m of conduit entering a pull box in a reinforced concrete structure may be Type 4.

10-3.09 MULTIDUCT CONDUIT SYSTEM

Where multiduct conduit system (MDCS) is shown on the plans or on the cost break down of these special provisions, the system shall be :

Size 32 (nominal) high density polyethylene conduits grouped in quantities of not less than four conduits. Requirements for high density polyethylene conduits are described in "High Density Polyethylene Conduit," in these special provisions.

All new MDCS conduits shall be cleaned with a mandrel or cylindrical soft bristled brush and blown out with compressed air until all foreign material is removed immediately prior to sealing empty conduits or installing cables. Cleaning shall be performed in the presence of the Engineer. The ends of conduits shall be sealed with an approved sealing compound. The ends of multiduct conduit system shall be sealed with sealing plugs as described in these special provisions.

Size 103 conduits (and conduits contained within) and Size 32 conduits shall be either all individually factory color coded or all orange. Straight segments of Type 3 multiduct conduit shall be nominal 6 m lengths.

Joints shall be solvent welded or sealed with a gasket as recommended by the manufacturer. Joints shall lock together or be provided with a seating mark to verify proper assembly.

Bends in Type 3 conduits shall be rigid factory assembled sections designed to fit the system.

The minimum conduit bend radius in Type 3 conduits shall not be less than 1.8 meters.

Multiduct conduit system (MDCS) trench and backfill requirements shall be as shown on the plans and as described in these special provisions.

10-3.10 HIGH DENSITY POLYETHYLENE CONDUIT

GENERAL

High density polyethylene (HDPE) conduit for communications applications shall conform to the details shown on the plans, these special provisions, and as directed by the Engineer.

MATERIAL

High density polyethylene conduit shall be manufactured from high density polyethylene virgin compounds.

High density polyethylene compounds used in the manufacture of communication conduit shall conform to the following Cell Classifications specified in ASTM Designation: D 3350:

| Property | Cell Classification |
|---------------------------------------|---------------------|
| Density | 3 |
| Melt Index | 3 or 4 |
| Flexural modulus | 4 or 5 |
| Tensile strength | 4 |
| Environmental stress crack resistance | 3 |
| Hydrostatic design basis | 0, 1, 2, 3 or 4 |
| Ultraviolet stabilizer | C ^b |

b - HDPE Resin shall contain not less than 2 ± 0.5 percent carbon black ultraviolet stabilizer

CONDUIT

High density polyethylene conduit size (nominal trade inside diameter) and location shall be as shown on the plans. Conduit shall be the smooth interior wall type.

High density polyethylene conduit shall be suitable for cable and conductor installation methods as described in Section 86 of the Standard Specifications, in these special provisions, and in "Air Blown Method" as described elsewhere in these special provisions.

High density polyethylene conduit color shall be black with orange colored stripe. Orange colored stripe shall consist of not less than 2 stripes, with longitudinal orientation, evenly spaced.

Conduit shall contain carbon black ultraviolet shielding suitable for the conduit to sustain unprotected outdoor exposure for at least one year.

Conduit shall be continuously marked with clear, distinctive and permanent markings at intervals not greater than 2 meters. The marking shall be in a contrasting color to the conduit color. The height of the marking shall be approximately 2.5 mm or larger. Conduit marking information shall include, as a minimum, the following information:

- A. Nominal Size
- B. Dimension Ratio (DR)
- C. Manufacturer Name and Product/Model Number
- D. Material Code
- E. Plant Identification
- F. Production Date
- G. Cell Classification

Coils and reels shall have sequential measurement markings every meter.

High density polyethylene conduit shall be DR 11 per ASTM D 3035 for controlled outside diameter.

High density polyethylene conduit shall be IPS outside diameter controlled in accordance with the manufacturer's production tolerances. The wall thickness of DR or SDR sized conduit shall be in accordance with the manufacturer's production tolerances.

High density polyethylene conduit shall meet or exceed the following:

| PROPERTY | TEST METHOD (ASTM unless shown otherwise) | UNIT | VALUE (Nominal) |
|---------------------------------------|-------------------------------------------|-------------------|------------------------------------------|
| Material Classification | D 3350 | | PE33 or PE34 |
| Density | D 1505 | g/cm ³ | 0.941 |
| Flow Rate | D 1238 | g/10 Min. | 0.40 |
| Flexural Modulus | D 790 | MPa | 552 |
| Tensile Strength | D 638 | MPa | 20.6 |
| Environmental Stress Crack Resistance | D 1693 | Hours | Meet Cell Classification 3 |
| HDB @ 23°C | D 2837 | MPa | Meet Cell Classification 0, 1, 2, 3 or 4 |
| UV Stabilizer | D 1603 | %C | not less than 2 |
| Hardness | D 2240 | Shore D | 60-68 |
| Elongation | D 638
(50.8 mm/Min) | %, minimum | 750 |
| Brittleness Temperature | D 746 | °C | <-75 |
| Vicat Softening Temperature | D 1525 | °C | 123 |

JOINING OF CONDUIT

Conduit shall be joined by heat fusion. Heat fusion (includes electrofusion) of high density polyethylene conduit shall be by methods recommended by the conduit manufacturer, and with equipment approved for the purpose. Equipment shall not expose conduit to direct flame. Heat fusion shall be performed by conduit manufacturer certified or authorized personnel. A minimum of 2 test fusions, by each fusion operator, shall be demonstrated to the Engineer prior to performing fusion operations on any high density polyethylene conduit to be installed.

Where high density polyethylene conduit is shown on the plans to join Type 3 conduit, mechanical fittings designed for joining polyethylene conduit to another material may be used. Mechanical fittings shall be pressure rated at not less than 400 kPa, and fully thrust restrained such that the fitting does not disjoin under longitudinal load of up to 35 kg.

INSTALLATION

High density polyethylene conduit shall be installed at underground locations only.

In addition to the conduit installation methods for Type 3 Conduit, as described in Section 86 of the Standard Specifications and in these special provisions, high density polyethylene conduit may be installed by Horizontal Directional Drilling (HDD) (per ASTM F1962 "Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacle, Including River Crossings") or "Directional Boring Method" as described elsewhere in these special provisions. Where there is a difference or conflict between requirements, the higher of the two standards shall apply.

Conduit bends, except factory bends, shall have a radius of not less than the manufacturer's recommended minimum bend radius. Where factory bends are not used, conduit shall be bent, without crimping or flattening, using the longest radius practicable.

Bending of high density polyethylene conduit shall be by methods recommended by the conduit manufacturer, and with equipment approved for the purpose. Equipment shall not expose conduit to direct flame.

Attention is directed to "Conduit" elsewhere in these special provisions regarding cleaning and sealing conduit.

The ends of high density polyethylene conduit shall be capped until the installation of cable is started.

A pull rope, conforming to Section 86-2.05C, "Installation," of the Standard Specifications shall be installed in conduits which are to receive future conductors.

CERTIFICATES OF COMPLIANCE, MATERIALS RECEIVING INSPECTION AND MANUFACTURER'S DATA

In conformance with the provisions in Section 6-1.07, "Certificates of Compliance," a Certificate of Compliance shall be furnished to the Engineer for each type of high density polyethylene conduit furnished. The certificate shall also certify that the high density polyethylene conduit complies with the requirements of these special provisions, and shall include the resin material Cell Classification, unit mass of pipe, average pipe stiffness and date of manufacture.

Conduit, when delivered to the site, which exhibits damage in excess of 10% of the conduit wall thickness may be rejected by the Engineer. Conduit exhibiting damage which does not meet the manufacturer's recommendations for usable conduit may also be rejected by the Engineer. Conduit sections may be repaired if approved by the Engineer. Replacement or repair of rejected conduit shall be at the Contractor's expense.

Two copies of the manufacturer's product technical specification information shall be furnished to the Engineer at least two weeks subsequent to the start of the scheduled delivery.

Two copies of the manufacturer's test data for the delivered shipment shall be furnished to the Engineer at the time of the delivery.

10-3.11 AIR BLOWN METHOD

At the Contractor's option, installation of cable into conduit, ducts or subducts may be performed using an "Air Blown Method".

The "Air Blown Method" shall be an installation method that uses a mechanical device combined with a high speed flow of compressed air to place cables into conduits, ducts or subducts.

The "Air Blown Method" shall conform to the following:

The method shall install cable without exceeding the cable manufacturers' tensile and compressive strength ratings.

The mechanical device shall be used to provide a pushing force on the cable into the conduit.

The cable installation equipment shall also have, at minimum, the following features:

- 1) Controls to regulate the flow rate of compressed air entering the conduit, duct or subduct, and any hydraulic or pneumatic pressure applied to the cable.
- 2) Safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.
- 3) Measuring device to determine the speed of the cable during installation and the length of the cable installed.

Information on the proposed "Air Blown Method" shall be submitted to the Engineer. The submittal shall include, but not be limited to, the following items:

1. Project description;
2. List or plan sheet marked to identify the conduits and cables involved;
3. Equipment description and specifications;
4. Manufacturer's test data covering the performance of the equipment and cable stress in a typical installation using cable equivalent to cable to be installed on this project; and
5. User/Installer Manual for the equipment and installation procedures.

Within 30 days after the approval of the contract, the Contractor shall submit 2 copies of the proposed "Air Blown Method" to the Engineer. The Contractor shall allow 7 days for the Engineer to review the proposed "Air Blown Method". If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the proposed "Air Blown Method" within 5 days of receipt of the Engineer's comments and shall allow 5 days for the Engineer to review the revisions. Upon the Engineer's approval of the proposed "Air Blown Method", 2 additional copies of the proposed "Air Blown Method" incorporating the required changes shall be submitted to the Engineer. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the proposed "Air Blown Method". In order to allow construction activities to proceed, the Engineer may conditionally approve, in writing, the proposed "Air Blown Method" while minor revisions or amendments are being completed.

The submitted "Air Blown Method" shall not be used until it has been approved in writing by the Engineer.

10-3.12 SEALING PLUG

Except as otherwise noted, multiduct conduit system and Size 103 conduits shall have their ends sealed with commercial preformed plugs which prevent the passage of gas, dust and water into the multiduct conduit system and Size 103 conduits.

Sealing plugs shall be removable and reusable. Plugs sealing conduit, conductor or cable shall be the split type that permits installation or removal without removing conductors or cables. Sealing plugs shall be capable of withstanding a pressure of 34.5 kPa.

Sealing plugs that seal MDCS (Size 103) shall seal the conduit and all enclosed conduits simultaneously with one self contained assembly having an adjustable resilient filler of neoprene or silicone rubber clamped between backing ends and compressed with stainless steel hardware.

Sealing plugs that seal the Size 25 or Size 32 conduits of MDCS shall seal each conduit individually with appropriate sizes and configuration to accommodate either empty conduit or those containing cable. Suitable sealing between the varying size cables and the plugs shall be provided by inserting split neoprene or silicone adapting sleeves, used singularly or in multiples, within the body of the plugs, or an equivalent method approved by the Engineer.

A sealing plug that seals an empty conduit shall have an eye or other type of capturing device (on the side of the plug that enters the conduit) to attach onto the pull rope so the pull rope will be easily accessible when the plug is removed.

10-3.13 TRACER WIRE

Tracer wire shall be provided and placed inside the MDCS conduit. The wire shall be placed in the uppermost conduit.

Tracer wire shall be No. 8 stranded, minimum, copper conductor with Type TW, THW, RHW, or USE insulation. The tracer wire shall form a mechanically and electrically continuous line throughout the length of the trench. A minimum of 1.5 m of slack shall be extended into each pull box and fiber optic vault from each direction. The wires shall be carefully placed so as not to be damaged by backfilling operations.

Tracer wire may be spliced at intervals of not less than 150 m.

10-3.14 WARNING TAPE

Warning tape shall be provided and placed in the trench over conduits as shown on the plans. The warning tape shall be 100 mm wide with bold printed black letters of approximately 19 mm on bright orange color background, and contain the printed warning "CAUTION CALTRANS FIBER OPTIC LINE BURIED BELOW", repeated at approximately 800 mm intervals.

The printed warning shall be non-erasable and shall be rated to last with the tape for a minimum of 40 years.

The construction of the warning tape shall be such that it will not delaminate when it is wet. It shall be resistant to insects, acid, alkaline and other corrosive elements in the soil. It shall have a minimum of 712 N tensile strength per 150 mm wide strip and shall have a minimum of 700 percent elongation before breakage.

10-3.15 SLURRY CEMENT BACKFILL

The slurry cement backfill for the installation of multiduct conduit system or other conduit as shown on the plans shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

The size of the aggregate shall not be larger than 9.5 mm.

The concrete shall be pigmented a medium to dark, red or orange color by the addition of commercial quality cement pigment to the concrete mix. The red or orange concrete pigment shall be LM Scofield Company; Orange Chromix Colorant; Davis Colors; or equal.

Full compensation for furnishing and incorporating the cement pigment to achieve the color required shall be considered as included in the contract price or prices paid per meter for the conduit involved and no separate payment will be made therefor.

10-3.16 DIRECTIONAL BORING METHOD

Where jacking and drilling is shown on the plans as the required installation method, conduits may be installed by the directional boring method. Directional boring shall not be used at other locations unless approved by the Engineer. All pull boxes or vaults shall be located at the locations shown on the plans.

Minimum depth of conduit below finished grade in pavement areas shall be 2.5 m.

A listing of materials (composition and strength) and methods used in directional boring shall be submitted for the Engineer's review.

The diameter of the boring tool shall not exceed 1.5 times the outside diameter of the conduit. Mineral slurry or wetting solution shall only be used to lubricate the boring tool and to stabilize the soil surrounding the boring path. Mineral slurry or wetting solution shall be water based and environmentally safe.

Residue from directional boring operations shall be handled in the same manner as residue from slot cutting operations described in Section 86-5.01A(5), "Installation Details," of the Standard Specifications.

The directional boring equipment shall have directional control of the boring tool and have an electronic boring tool location detection system. During operation, the directional boring equipment shall be able to determine the location of the tool both horizontally and vertically.

The directional boring equipment shall be equipped with a tension measuring device that indicates the amount of tension exerted on conduit during conduit pulling operations.

Slurry cement backfill and warning tape, as shown on the plans for trench installations of conduit, are not required where the directional boring method is used. Tracer wire shall be attached to the uppermost conduit prior to conduit installation.

A representative of the Contractor must be in direct charge and control of the directional boring operation at all times.

The Engineer shall be notified in writing 2 working days in advance of starting directional boring operations. The location and equipment to be used in the boring operation shall be included in the advance notice to the Engineer. Directional boring shall only be performed in the presence of the Engineer unless otherwise notified in writing by the Engineer.

Full compensation for directional boring shall be considered as included in the contract unit price paid for the conduit involved and no additional compensation will be allowed therefor.

10-3.17 TRENCH DELINEATOR

Trench delineator shall consist of a flexible post conforming to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Delineators on flexible posts shall be as specified in "Prequalified and Tested Signing and Delineation Materials" elsewhere in 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.

Flexible posts shall be installed at locations shown on the plans directly above fiber optic conduit (in the same trench) offset enough to not hit the warning tape.

The flexible post may be installed by placing it in the trench prior to backfilling and compacting or by placing it in a 450 mm steel anchor sleeve that is driven into the ground prior to installing the flexible post. The flexible post and anchor shall have locking tabs that prevent the removal of the flexible post from the anchor sleeve.

Flexible posts shall extend a minimum of 0.9 m and a maximum of 1.2 m above ground and a minimum of 450 mm and a maximum of 600 mm below ground.

The message on the flexible post shall be black text on orange non-reflective background, shall be located at the top of the post, and shall face approaching traffic. The message shall read: "WARNING, FIBER OPTIC CABLE". Below this message shall be a smaller message that reads: "BEFORE EXCAVATING OR IN AN EMERGENCY CALL CALTRANS, SAN DIEGO, CA (619) 688-6785".

10-3.18 PULL BOXES

Grout shall not be placed in the bottom of pull boxes.

10-3.19 FIBER OPTIC VAULT

Fiber optic vault, cover and extensions (if required) shall be of the sizes and details shown on the plans and shall be precast of non-PCC material. Non-PCC material shall be resistant to fire, chemicals and ultraviolet exposure. The non-PCC material shall show no appreciable change in physical properties with exposure to the weather. Non-PCC material shall be dense and free of voids or porosity.

Covers shall be the non-skid type. Cover marking shall be "CALTRANS FIBER OPTICS" on each cover. Each cover shall have inset lifting pull slots. Cover hold down bolts or cap screws and nuts shall be of brass, stainless steel, or other non-corroding metal material.

A reinforced concrete encasement ring shall be poured around the collar of the fiber optic vault as shown on the plans. The concrete for encasement ring shall contain not less than 325 kg of cement per cubic meter.

Fiber optic vaults and covers shall be rated for AASHTO HS 20-44 loads and be installed as detailed and where shown on the plans.

Hanger assemblies shall consist of not less than 3 hangers evenly distributed. Hangers shall be made of a non-corroding material and be free of any sharp edges. Hanger assembly shall be provided for a minimum of eight fiber optic cables and be securely fastened to the side wall with the slack fiber optic cable neatly coiled.

The Contractor shall not install additional fiber optic vaults over those shown on the plans without the Engineer's written approval.

10-3.20 CONDUCTORS AND WIRING

Splices of conductors shall be insulated with heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating.

Heat-shrink tubing shall be heated as recommended by the manufacturer.

SIGNAL INTERCONNECT CABLE

Signal Interconnect Cable (SIC) shall be the 6-pair type.

The ends of signal interconnect cable terminating at controller and telephone demarcation cabinets shall have crimped and soldered spade type terminals.

SIGNAL CABLE

The color code for the conductors in the nine-conductor cable shall be as noted on the plans.

10-3.21 CATEGORY 5E CABLE

Category 5E cable shall be the unshielded, outdoor rated, non-gel filled type, and shall meet the requirements of TIA/EIA 568B.2, Category 5E Cable, and the following:

- A. The cable shall contain 8 conductors, each of which shall be No. 24 , minimum, solid bare copper conductors. Each conductor shall be insulated with polyolefin, polyethylene, polyvinyl chloride or fluorinated ethylene propylene material. Conductors shall be in twisted pairs. Color coding shall distinguish each pair: blue, blue/white; brown, brown/white; green, green/white; orange, orange/white.
- B. The cable jacket shall be rated for a minimum of 300 V and 60°C and shall be polyvinyl chloride, polyethylene, polyolefin or fluorinated ethylene propylene. The jacket shall be black, gray, or blue. The jacket shall be marked as required by NEMA. The jacket shall be marked at not more than every meter with the cable identification: manufacturer's name, product identification, number of conductors and conductor size, and voltage and temperature ratings. Cable length markings may be sequentially alternated with the cable identification markings at not more than every other meter.
- C. The finished outside diameter of the cable shall not exceed 13 mm.
- D. The cable run between components shall be continuous without splices. A minimum of one meter of slack shall be provided at each pull box, junction box or vault, and a minimum of 3 m at each cabinet. The ends of category 5E cable shall be terminated with appropriate RJ-type connectors as necessary to connect the equipment shown on the plans, or shall be terminated with crimped and soldered spade type terminals at terminal blocks where shown on the plans.
- E. Category 5E Certified installations are required for installed lengths of less than 100 m of finished cable.

10-3.22 FIBER OPTIC COMMUNICATION CABLE PLANT

FIBER OPTICS GLOSSARY

Breakout.--The cable "breakout" is produced by; (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 1 to 2 meters of the cable buffers, aramid strength yarn and central fiberglass strength member, and (3) cutting the aramid yarn, central strength member and the buffer tubes to expose the individual glass fibers for splicing or connection to the appropriate device.

Connector.--A mechanical device used to align and join two fibers together to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (patch panel).

Connectorized.--The termination point of a fiber after connectors have been affixed.

Couplers.--Couplers are devices which mate fiber optic connectors to facilitate the transition of optical light signals from one connector into another. They are normally located within FDFs mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

Fiber Distribution Frame (FDF).--A rack mounted system that consists of a standard equipment rack, fiber routing guides, horizontal jumper troughs and Fiber Distribution Unit (FDU).

The FDF serves as the "home" for the passive fiber optic components from cable breakout, for connection by jumpers, to the electronics.

Fiber Distribution Unit (FDU)--Is an enclosure or rack-mountable unit containing both a patch panel with couplers and a splice tray(s).

F/O.--Fiber optic.

FOIP.--Fiber optic inside plant cable.

FOP.--Fiber optic outside plant cable.

FOTP.--Fiber optic test procedure(s) as defined by EIA/TIA standards.

Jumper.--A short fiber optic cable that has connectors installed on both ends, and is typically used for connection within a FDF.

Light Source.--Portable fiber optic test equipment that, in conjunction with a power meter, is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the designed wavelength of the system under test.

Link.--A passive section of the system, the ends of which are to be connected to active components. A link may include splices and couplers. For example, a video link may be from a F/O transmitter to a video multiplexer (MUX).

Link Loss Budget.--A calculation of the overall permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector).

Loose Tube Cable.--Type of cable construction in which fibers are placed in filled buffer tubes to isolate them from outside forces (stress). A flooding compound is applied to the interstitial cable core to prevent water migration and penetration. This type of cable is primarily for outdoor applications.

Optical Time Domain Reflectometer (OTDR).--Fiber optic test equipment (similar in appearance to an oscilloscope) that is used to measure the total amount of power loss between two points and the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors and the losses that are attributed to each component or defect in the fiber.

Patchcord.--A short jumper used to join two Connector Module Housing (CMH) couplers or a CMH and an active device (electronics).

Pigtail.--Short fiber optic cable that has a connector installed on only one end.

Plenum Cable.--NEC approved cable installed in air plenums (the area between a drop ceiling and the floor above it) without the use of conduit.

Power Meter.--Portable fiber optic test equipment that, in conjunction with a light source, is used to perform end-to-end attenuation testing. It contains a detector that is sensitive to light at the designed wavelength of the system under test. Its display indicates the amount of power injected by the light source that arrives at the receiving end of the link.

Riser Cable.--NEC approved cable installed in a riser (a vertical shaft in a building connecting one floor to another).

Segment.--A section of F/O cable that is not connected to any active device and may or may not have splices per the design.

Splice.--The permanent joining of fiber ends to matching fibers.

Splice Closure.--Normally installed in a splice vault, a splice closure is an environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from multiple locations.

Splice Module Housing (SMH).--The SMH stores splice trays as well as pigtails and short cable lengths.

Splice Tray.--A container used to organize and protect spliced fibers.

Splice Vault.--A splice vault is used to house splice closures.

Storage Cabinet.--Designed for holding excess cable slack for protection. The storage cabinet allows the user flexibility in equipment location and the ability to pull cable back for resplicing.

Tight Buffered, Non-Breakout Cable (Tight Buffer Cable).--Type of cable construction where each glass fiber is tightly buffered (directly coated) with a protective thermoplastic coating to 900 μm (compared to 250 μm for loose tube fibers). Increased buffering is desirable over loose tube cables because of its resulting ease of handling and connectorization (increased physical flexibility, smaller bend radius requirements), and ability to meet NEC flammability requirements.

FIBER OPTIC OUTSIDE PLANT CABLE

GENERAL

Each fiber optic outside plant cable (FOP) for this project shall be all dielectric, gel filled or water blocking materials, duct type, with loose buffer tubes and shall conform to these special provisions. Cables with singlemode fibers shall contain singlemode (SM) dual-window (1310 nm and 1550 nm) fibers in the quantities shown below and on the plans. The optical fibers shall be contained within loose buffer tubes. The loose buffer tubes shall be stranded around an all dielectric central member. Aramid yarn or fiberglass shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

All fiber optic (F/O) cable on this project shall be from the same manufacturer, who is regularly engaged in the production of this material.

The cable shall comply with all the requirements of the United States Department of Agriculture Rural Electrification Administration specifications REA-PE-90 as described elsewhere in these Special Provisions.

| Fiber Characteristics Table | |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Parameters | SM |
| Type | Step Index |
| Core diameter | 8.3 μm (nominal) |
| Cladding diameter | 125 μm \pm 1.0 μm |
| Core to Cladding Offset | \leq 1.0 μm |
| Coating Diameter | 250 μm \pm 15 μm |
| Cladding Non-circularity
defined as: $[1 - (\text{min. cladding dia} \div \text{max. cladding dia.})] \times 100$ | \leq 2.0% |
| Proof/Tensile Test | 345 MPa |
| Attenuation:
@ 850 nm
@1310 nm (SM)
@1550 nm | N/A
\leq 0.4 dB/km
\leq 0.4 dB/km |
| Attenuation at the Water Peak | \leq 2.1 dB/km @
1383 \pm 3 nm |
| Bandwidth:
@ 850 nm
@1310 nm (SM) | N/A
N/A |
| Bandwidth:
@ 850 nm
@1310 nm (SM) | N/A
N/A |
| Chromatic Dispersion: | |
| Zero Dispersion Wavelength | 1301.5 to 1321.5 nm |
| Zero Dispersion Slope | \leq 0.092 ps/(nm ² *km) |
| Maximum Dispersion: | \leq 3.3 ps/(nm*km) for
1285 to 1330 nm
<18 ps/(nm*km) for
1550 nm |
| Cut-Off Wavelength | <1250 nm |
| Numerical Aperture
(measured in accordance with
EIA-455-47 (FOTP-47)) | N/A |
| Mode Field Diameter
(Petermann II) | 9.3 \pm 0.5 μm at
1300 nm
10.5 \pm 1.0 μm at
1550 nm |

FIBER CHARACTERISTICS

Each optical fiber shall be glass and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube shall be usable fibers, and shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of these specifications. The required fiber grade SM shall reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable.

The coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically or chemically strippable without damaging the fiber.

The cable shall comply with the optical and mechanical requirements over an operating temperature range of -40°C to +70°C. The cable shall be tested in accordance with EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The change in attenuation at extreme operational temperatures (-40°C to +70°C) for singlemode fiber shall not be greater than 0.20 dB/km, with 80 percent of the measured values no greater than 0.10 dB/km. The singlemode fiber measurement is made at 1550 nm.

For all fibers the attenuation specification shall be a maximum attenuation for each fiber over the entire operating temperature range of the cable.

Singlemode fibers within the finished cable shall meet the requirements in the following table:

| Fiber Characteristics Table | |
|------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Parameters | Singlemode |
| Type | Step Index |
| Core diameter | 8.3 μm (nominal) |
| Cladding diameter | 125 μm ±1.0 μm |
| Core to Cladding Offset | ≤0.8 μm |
| Coating Diameter | 250 μm ±15 μm |
| Cladding Non-circularity defined as:
[1-(min. cladding dia ÷ max. cladding dia.)]x100 | ≤1.0% |
| Proof/Tensile Test | 345 MPa, min. |
| Attenuation: (-40°C to +70°C)
@1310 nm
@1550 nm | ≤0.4 dB/km
≤0.3 dB/km |
| Attenuation at the Water Peak | ≤2.1 dB/km @ 1383 ±3 nm |
| Chromatic Dispersion:
Zero Dispersion Wavelength
Zero Dispersion Slope | 1301.5 to 1321.5 nm
≤0.092 ps/(nm ² *km) |
| Maximum Dispersion: | ≤3.3 ps/(nm*km) for 1285 – 1330 nm
<18 ps/(nm*km) for 1550 nm |
| Cut-Off Wavelength | <1250 nm |
| Mode Field Diameter
(Petermann II) | 9.3 ±0.5 μm at 1300 nm
10.5 ±1.0 μm at 1550 nm |

COLOR CODING

Optical fibers shall be distinguishable from others in the same buffer tube by means of color coding according to the following:

- | | |
|----------------|-----------------|
| 1. Blue (BL) | 7. Red (RD) |
| 2. Orange (OR) | 8. Black (BK) |
| 3. Green (GR) | 9. Yellow (YL) |
| 4. Brown (BR) | 10. Violet (VL) |
| 5. Slate (SL) | 11. Rose (RS) |
| 6. White (WT) | 12. Aqua (AQ) |

The colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598 "Color Coding of Fiber Optic Cables."

The color formulation shall be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

CABLE CONSTRUCTION

General.--The fiber optic cable shall consist of, but not be limited to, the following components:

- A. Buffer tubes
- B. Central member
- C. Filler rods
- D. Stranding
- E. Core and cable flooding
- F. Tensile strength member
- G. Ripcord
- H. Outer jacket

Buffer tubes.--Loose buffer tubes shall provide clearance between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes and shall not adhere to the inside of the tube. Each buffer tube shall contain 6 or 12 fibers.

The loose buffer tubes shall be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material shall be tough and abrasion resistant to provide mechanical and environmental protection of the fibers, yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tube filling compound shall be a homogenous hydrocarbon-based gel with anti-oxidant additives and used to prevent water intrusion and migration. The filling compound shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. The filling compound shall be free from dirt and foreign matter and shall be readily removable with conventional nontoxic solvents.

Buffer tubes shall be stranded around a central member by a method that will prevent stress on the fibers when the cable jacket is placed under strain, such as the reverse oscillation stranding process.

Each buffer tube shall be distinguishable from other buffer tubes in the cable by means of color coding as specified above for fibers.

Central Member.--The central member which functions as an anti-buckling element shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. A linear overcoat of low density polyethylene shall be applied to the central member to achieve the optimum diameter to provide the proper spacing between buffer tubes during stranding.

Filler rods.--Fillers may be included in the cable to lend symmetry to the cable cross-section where needed. Filler rods shall be solid medium or high density polyethylene. The diameter of filler rods shall be the same as the outer diameter of the buffer tubes.

Stranding.--Completed buffer tubes shall be stranded around the overcoated central member using stranding methods, lay lengths and positioning such that the cable shall meet mechanical, environmental and performance specifications. A polyester binding shall be applied over the stranded buffer tubes to hold them in place. Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

Core and Cable Flooding.--The cable core interstices shall be filled with a polyolefin based compound to prevent water ingress and migration. The flooding compound shall be homogeneous, non-hygroscopic, electrically non-conductive, and non-nutritive to fungus. The compound shall also be nontoxic, dermatologically safe and compatible with all other cable components.

Tensile Strength Member.--Tensile strength shall be provided by high tensile strength aramid yarns or fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

Ripcord.--The cable shall contain at least one ripcord under the jacket for easy sheath removal.

Outer jacket.--The jacket shall be free of holes, splits, and blisters and shall be medium or high density polyethylene (PE), or medium density cross-linked polyethylene with minimum nominal jacket thickness of $1000 \pm 76 \mu\text{m}$. Jacketing material shall be applied directly over the tensile strength members and flooding compound and shall not adhere to the aramid strength material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The jacket or sheath shall have clear, distinctive and permanent markings showing the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", year of manufacture, and sequential measurement markings every meter. The actual length of the cable shall be within $-0/+1$ percent of the length marking. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

GENERAL CABLE PERFORMANCE SPECIFICATIONS

The F/O cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with EIA-455-82 (FOTP-82), "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable."

A representative sample of cable shall be tested in accordance with EIA-455-81A (FOTP-81), "Compound Flow (Drip) Test for Filled Fiber Optic Cable". No preconditioning period shall be conducted. The cable shall exhibit no flow (drip or leak) at 80°C as defined in the test method.

A representative sample of cable shall be tested in accordance with EIA-455-81A, "Compound Flow (Drip) Test for Filled Fiber Optic Cable". The test sample shall be prepared in accordance with Method A. The cable shall exhibit no flow (drip or leak) at 80°C as defined in the test method.

Crush resistance of the finished F/O cables shall be 220 N/cm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with EIA-455-41 (FOTP-41), "Compressive Loading Resistance of Fiber Optic Cables." The average increase in attenuation for the fibers shall be ≤ 0.10 dB at 1550 nm (singlemode) for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after removal of load. Testing shall be in accordance with EIA-455-41 (FOTP-41), except that the load shall be applied at the rate of 3 mm to 20 mm per minute and maintained for 10 minutes.

The cable shall withstand 25 cycles of mechanical flexing at a rate of 30 ± 1 cycles/minute. The average increase in attenuation for the fibers shall be ≤ 0.20 dB at 1550 nm (singlemode) at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. The test shall be conducted in accordance with EIA-455-104 (FOTP-104), "Fiber Optic Cable Cyclic Flexing Test," with the sheave diameter a maximum of 20 times the outside diameter of the cable. The cable shall be tested in accordance with Test Conditions I and II of (FOTP-104).

The cable shall withstand 20 impact cycles with total impact energy of 5.9 Nm. The average increase in attenuation for the fibers shall be ≤ 0.20 dB at 1550 nm (singlemode). The cable jacket shall not exhibit evidence of cracking or splitting. The test shall be conducted in accordance with EIA-455-25 (FOTP-25), "Impact Testing of Fiber Optic Cables and Cable Assemblies."

The finished cable shall withstand a tensile load of 2700 N without exhibiting an average increase in attenuation of greater than 0.20 dB. The test shall be conducted in accordance with EIA-455-33 (FOTP-33), "Fiber Optic Cable Tensile Loading and Bending Test." The load shall be applied for one-half hour in Test Condition II of the EIA-455-33 (FOTP-33) procedure.

PACKAGING AND SHIPPING REQUIREMENTS

Documentation of compliance to the required specifications shall be provided to the Engineer prior to ordering the material.

Attention is directed to "Fiber Optic Testing," elsewhere in these special provisions.

The completed cable shall be packaged for shipment on reels. The cable shall be wrapped in a weather and temperature resistant covering. Both ends of the cable shall be sealed to prevent the ingress of moisture.

Each end of the cable shall be securely fastened to the reel to prevent the cable from coming loose during transit. Four meters of cable length on each end of the cable shall be accessible for testing.

Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable on the reel, the Contractor's name, the contract number, and the reel number. A shipping record shall also be included in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information.

The minimum hub diameter of the reel shall be at least thirty times the diameter of the cable. The F/O cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Two copies of the installation procedures and technical support information shall be furnished to the Engineer at least two weeks subsequent to the start of the scheduled delivery.

10-3.23 FIBER OPTIC LABELING

GENERAL

All fiber optic cables shall be labeled in a permanent and consistent manner. All labels shall be made of a material designed for permanent labeling. All labels shall be mechanically marked with permanent ink on non-metal type labels, or embossed lettering on metal type labels; hand written labels using pencil shall not be used except as noted below. Metal tags shall be constructed of stainless steel. Metal tags are required for use on fiber optic cables. Use of non-metal label materials shall be only as approved by the Engineer. At vaults and other underground locations, all labels and imprinting shall be weatherproof. Labels shall be affixed per the manufacturer's recommendations in a manner that will not cause damage to the cable or fiber.

CABLE IDENTIFICATION

Identification used for labeling of the fiber optic and copper cables will be provided to the Contractor by the Engineer. The quantity of characters will not be more than 40 for cables and not more than 20 for individual or fibers.

LABEL PLACEMENT

Fiber Optic Cables.--All cables shall be labeled at all terminations, even if no connections or splices are made, and at all splice vault entrance and exit points.

Cable to Cable Splices.--The cable shall be labeled at entry to splice enclosure.

Cable to Fiber Distribution Units.--The cable shall be labeled at entry to the FDU. Only one cable shall be terminated in each FDU. The FDU shall be labeled on the face of the FDU. Individual connections shall be clearly marked in pencil on the face of the FDU in the designated area as directed by the Engineer.

Fibers.--Fiber labels shall be placed next to the connectors of the individual fibers.

Jumpers.--Equipment to FDU Jumpers shall be labeled at both ends. FDU to FDU jumpers shall be labeled at each end.

Pigtails.--Pigtails shall be labeled at the connector.

10-3.24 FIBER OPTIC CABLE INSTALLATION

Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. Mechanical aids may be used, provided that a tension measuring device is placed in tension to the end of the cable, and the allowable tension does not exceed the manufacturers recommended pulling tension. A calibrated break-away feature shall be employed to work in tandem with the tension measuring device and limit excessive tension by disengaging when a set tension is exceeded.

When mechanical aids are proposed for use in pulling fiber optic cable, information on the proposed methods, the time frames and requirements for submittal, review and approval, and the conditions for use of the proposed method shall conform to the requirements for information submitted as required for a proposed "Air Blown Method" as described in "Air Blown Method," elsewhere in these special provisions.

Except when the "Air Blown Method" is used, F/O cable shall be installed using a cable pulling lubricant recommended by the F/O cable or the conduit manufacturer and a non-abrasive pull tape conforming to the provisions described under "MDCS" elsewhere in these special provisions.

Splices shall be limited to locations as shown on the plans and as directed by the Engineer.

During cable installation, the bend radius shall be maintained at not less than twenty times the outside diameter of the cable. Stress relief component shall be installed at the entrance to FDU as recommended by the manufacturer

F/O cable shall be installed without splices except where specifically allowed on the plans or described in these special provisions. A minimum of 15 m of slack shall be provided at each vault without a cable splice. At fiber optic splice closures, a minimum of 9 m of each cable exiting the closure shall be stored in the vault.

Unless shown or provided otherwise, only one F/O cable shall be installed in each conduit.

10-3.25 SPLICING

Unless otherwise allowed, F/O cable splices shall be fusion type. The mean splice loss shall not exceed 0.07 dB per splice. The mean splice loss shall be obtained by measuring the loss through the splice in both directions and then averaging the resultant values.

The field splices shall connect the fibers of the two F/O cable lengths together. These splices shall be placed in a splice tray and these splice tray(s) shall then be placed in the splice closure.

Fibers of the same buffer tube, but not being spliced shall be placed in a splice tray along side spliced fibers. Buffer tubes that do not require enclosed fibers to be spliced shall not be disturbed and placed in the splice closure.

The termination splices shall connect the F/O cable span ends with pigtails. The termination splices shall be placed in a splice tray and the splice tray(s) shall then be placed in the fiber distribution unit (FDU). The individual fibers shall be looped one full turn within the splice tray to avoid micro bending. A 50 mm minimum bend radius shall be maintained during installation and after final assembly in the optical fiber splice tray. Each bare fiber shall be individually restrained in a splice tray. The optical fibers in buffer tubes and the placement of the bare optical fibers in the splice tray shall be such that there is no discernible tensile force on the optical fiber.

All splices shall be protected with a metal reinforced thermal shrink sleeve.

All fiber optic cables shall be labeled in the splice tray. Pigtail ends shall also be labeled to identify the destination of the fiber.

10-3.26 FIBER OPTIC SPLICE CLOSURE

The fiber optic field splices shall be enclosed in splice closures which shall be complete with splice organizer trays, brackets, clips, cable ties, and sealant, as needed. The splice closure shall be suitable for a direct burial or pull box application. Manufacturer's installations shall be supplied to the Engineer prior to the installation of any splice closures. Location of the splice closures shall be where a splice is required as shown on the plans, designated by the Engineer, or described in these special provisions.

The splice closure shall conform to the following specifications:

Non-filled thermoplastic case

Rodent proof, water proof, re-enterable and moisture proof

Expendable from 2 cables per end to 8 cables per end by using adapter plates

Cable entry ports shall accommodate 10 mm to 25 mm diameter cables

Multiple grounding straps

Accommodate up to 8 splice trays

Suitable for "butt" or "through" cable entry configurations

Place no stress on finished splices within the splice trays.

The fiber optic splice closure shall be suitable for a temperature range of 0°C to 40°C.

Each splice shall be individually mounted and mechanically protected in the splice tray.

The Contractor shall install the fiber splice closure in the fiber optic vaults where splicing is required. The fiber optic splice closures shall be securely fastened to the fiber optic vault or wall using standard hardware as recommended by the closure manufacturer.

The Contractor shall provide all mounting hardware required to securely mount the closures to the splice vault.

The fiber splice closure shall be mounted horizontally in a manner that allows the cables to enter at the end of the closure. Not less than 9 m of each cable shall be coiled in the vault to allow the fiber splice closure to be removed for future splicing.

10-3.27 SPLICE TRAY

Each splice tray shall conform to the following:

Accommodate the quantity of fusion splices as shown on the plans but not less than 12 fusion splices per tray.

Place no stress on completed splices within the tray.

Accommodate "butt" or "feed through" splicing applications.

Be stackable with a transparent snap-on hinge cover.

Accommodate buffer tubes securable with channel straps.

Contain fiber retention strips.

10-3.28 PASSIVE CABLE ASSEMBLIES AND COMPONENTS

The F/O cable assemblies and components shall be compatible components, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. All components or assemblies shall be best quality, non-corroding, with a design life of at least 20 years. All components or assemblies of the same type shall be from the same manufacturer.

10-3.29 FIBER OPTIC TESTING

GENERAL

Testing shall include the tests on elements of the passive fiber optic components: (1) at the factory, (2) after delivery to the project site but prior to installation and, (3) after installation. The Contractor shall provide all personnel, equipment, instrumentation and materials necessary to perform all testing. The Engineer shall be notified two working days prior to all field tests. The notification shall include the exact location or portion of the system to be tested.

A minimum of 15 working days prior to arrival of the cable at the site, the Contractor shall provide detailed test procedures for all field testing for the Engineer's review and approval. The procedures shall identify the tests to be performed and how the tests are to be conducted. Included in the test procedures shall be the model, manufacturer, configuration, calibration and alignment procedures for all proposed test equipment.

Documentation of all test results shall be provided to the Engineer within 2 working days after the test is completed.

FACTORY TESTING

Documentation of compliance with the fiber specifications as listed in the fiber characteristics table shall be supplied by the original fiber manufacturer. Before shipment, but while on the shipping reel, 100 percent of all fibers shall be tested for attenuation. Copies of the results shall be attached to the cable reel in a waterproof pouch and submitted to the Contractor and to the Engineer.

ARRIVAL ON SITE

The cable and reel shall be physically inspected on delivery and the attenuation shall be measured for 100 percent of the fibers. The failure of any single fiber in the cable to comply with these special provisions, is cause for rejection of the entire reel. Test results shall be recorded, dated, compared and filed with the copy accompanying the shipping reel in a weather proof envelope. Attenuation deviations from the shipping records of greater than 5 percent shall be brought to the attention of the Engineer. The cable shall not be installed until completion of this test sequence and the Engineer provides written approval. Copies of traces and test results shall be submitted to the Engineer. If the test results are unsatisfactory, the reel of fiber optic cable shall be considered unacceptable and all records corresponding to that reel of cable shall be marked accordingly. The unsatisfactory reels of cable shall be replaced with new reels of cable at the Contractor's expense. The new reels of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

AFTER CABLE INSTALLATION

After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested with an OTDR for attenuation. Test results shall be recorded, dated, compared and filed with the previous copies of these tests. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the F/O cable segment will be unacceptable. The unsatisfactory segment of cable shall be replaced with a new segment, without additional splices, at the Contractor's expense. The new segment of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Singlemode fibers shall be tested at 1310 nm and 1550 nm after arrival on site and after cable installation. Attenuation readings in one direction after arrival on site and for each direction after installation shall be recorded on the cable data sheet. The Engineer shall review and notify the Contractor of the results in writing in five working days of "arrival on site test" and in ten working days of "after cable installation test".

OUTDOOR SPLICES

At the conclusion of all outdoor splices at one location, and before they are enclosed and sealed, all splices shall be tested with the OTDR, in both directions. Splices in segments shall be tested at 1310 nm and at 1550 nm. Individual fusion splice losses shall not exceed 0.07 dB. Measurement results shall be recorded, dated, validated by the OTDR trace printout and filed with the records of the respective cable runs. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the splice shall be unacceptable. The unsatisfactory splice shall be replaced at the Contractor's expense. The new splice shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

DISTRIBUTION INTERCONNECT PACKAGE TESTING AND DOCUMENTATION

All the components of the passive interconnect package (FDUs, pigtails, jumpers, couplers and splice trays as shown on the plans and in these special provisions) shall comprise a unit from a manufacturer who is regularly engaged in the production of the fiber optic components.

In developing the distribution interconnect package, each SC termination (pigtail or jumper) shall be tested for insertion attenuation loss with the use of an optical power meter and light source. In addition, all singlemode terminations shall be tested for return reflection loss. These values shall meet the loss requirements specified earlier and shall be recorded on a tag attached to the pigtail or jumper.

Once assembly is complete, the manufacturer shall visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the manufacturer shall do an "end to end" optical power meter/light source test from pigtail end to jumper lead end to assure continuity and overall attenuation loss values.

The final test results shall be recorded, along with previous individual component values, on a special form assigned to each FDU. The completed form shall be dated and signed by the Manufacturer's Quality Control supervisor. One copy of this form will be attached in a plastic envelope to the assembled FDU unit. Copies will be provided separately to the Contractor and to the Engineer, and shall be also be maintained on file by the manufacturer or supplier.

SYSTEM VERIFICATION AT COMPLETION

OTDR Testing.--Once the passive cabling system has been installed and is ready for activation, 100 percent of the fiber links shall be tested with the OTDR for attenuation. Print out shall include at least link number, fiber color, buffer color and cable number. Test results shall be recorded, dated, compared and filed with previous copies. A hard copy printout and an electronic copy of the traces and test results along with a licensed copy of the associated software on a DOS based 89 mm disk shall be submitted to the Engineer. If the OTDR test results are unsatisfactory the link shall be replaced at the Contractor's expense. The new link shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Power Meter and Light Source.--At the conclusion of the final OTDR testing, 100 percent of all fiber links shall be tested end to end with a power meter and light source, in accordance with EIA Optical Test Procedure 171 and in the same wavelengths specified for the OTDR tests. These tests shall be conducted in both directions. Test results shall be recorded, compared and proven to be within the design link loss budgets, and filed with the other recordings of the same links. Test results shall be submitted to the Engineer.

Link Loss Worksheet.--The Link Loss Worksheet shown in Appendix A shall be completed for 100 percent of all links in the fiber optic system, using the data gathered during cable verification. The completed worksheets shall be included as part of the system documentation.

Test Failures.--If the link loss measured from the power meter and light source exceeds the calculated link loss, or the actual location of the fiber ends does not agree with the expected location of the fiber ends (as would occur with a broken fiber), the fiber optic link will not be accepted. The unsatisfactory segments of cable, or splices shall be replaced with a new segment of cable or splice at the Contractor's expense. The OTDR testing, power meter and light source testing and Link Loss Worksheet shall be completed for the repaired link to determine acceptability. Copies of the test results shall be submitted to the Engineer. The removal and replacement of a segment of cable shall be interpreted as the removal and replacement of a single contiguous length of cable connecting two splices, two connectors or one splice and one connector. The removal of only the small section containing the failure and therefore introducing new unplanned splices, will not be allowed.

APPENDIX A

Link Loss Budget Worksheet

Contract No. _____

Contractor: _____

Approved by Caltrans: _____

Date: _____

Operator: _____

Link Number: _____

Fiber Color: _____

Buffer Color: _____

Cable No.: _____

Test Wavelength (Circle one): 1310 1550

Expected Location of fiber ends:

End 1: _____ End 2: _____

OTDR Test Results:

| | | |
|---------------|----------|---|
| Forward Loss: | _____ dB | 1 |
| Reverse Loss: | _____ dB | A |
| Average Loss: | _____ dB | 1 |
| | | B |
| | | 1 |
| | | C |

Power Meter and Light Source Test Results:

Forward Loss: _____ dB 2
 Reverse Loss: _____ dB A
 Average Loss [(2A + 2B)/2]: _____ dB 2

B
 2
 C

Calculated Fiber Loss:

Length of the link (from OTDR): _____ km 3
 Allowed loss per km of fiber: 0.4 dB/km A
 Total Allowed Loss due to the fiber (3A * 3B): _____ dB 3

B
 3
 C

Calculated Splice Loss:

Number of Splices in the Link: _____ 4
 Allowed Link Loss per Splice: 0.07 dB A
 Total Allowed Loss due to Splices (4A * 4B): _____ dB 4

B
 4
 C

Calculated Link Loss:

Connector Loss: 0.9 dB 5
 Total Link Loss (5A + 3C + 4C): _____ dB A

5
 B

Cable Verification:

Compare Power Meter Average Loss to Calculated Link Loss (2C - 5B): _____ dB 6
 If the value of 6A is greater than zero, the link has failed the Test. See Test Failures elsewhere in these special provisions. A

 To Be Completed by Caltrans:
 Resident Engineer's Signature: _____
 Cable Link Accepted: _____

10-3.30 FIBER DISTRIBUTION UNIT

The Contractor shall furnish and install all related equipment to interface the fiber distribution unit (FDU) to the incoming fiber optic communication cables.

The units shall accommodate the fiber optic cable described elsewhere in these special provisions.

Type A FDU shall accommodate termination of not less than 140 individual fibers.

Type C FDU shall accommodate termination of 12 individual fibers.

The FDU shall provide interconnect capability and shall include the following:

1. A patch panel to terminate singlemode fiber with SC type connector feed through adapters.
2. Storage for splice trays.

The patch panel shall be hinged to provide easy access and maintenance. Brackets shall be provided to spool the incoming fiber a minimum of three turns, each turn of not less than 250 mm in length, before separating out individual fibers to the splice tray. Strain relief shall be provided for the incoming fiber optic cable. All fibers shall be terminated and identified in the FDU.

The FDU (Type A) shall be 475 mm rack mountable and not to exceed 435 mm (W) x 500 mm (H) x 375 mm (D).

The FDU (Type C) shall be 475 mm rack mountable and not to exceed 435 mm (W) x 50 mm (H) x 305 mm (D).

10-3.31 CLOSED CIRCUIT TELEVISION CAMERA CABLE ASSEMBLY

Closed circuit television (CCTV) camera cable assembly shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

The interconnect wiring between the CCTV camera assembly and the Camera Encoder Unit (CEU) shall be a composite cable that includes flexible 75-ohm coaxial cable, AC power and control cable.

The cable shall conform to the following physical characteristics:

Overall Cable

| | |
|--------------------------------------------------------|-------------------------------|
| Overall Cable, Nom. weight/304.8 meters not to exceed: | 132 kg |
| Overall Cable Minimum Bending Radius: | 229 mm |
| All Materials, Temperature Rating, meet or exceed: | -40°C to +80°C |
| Overall Cable, Outside Diameter, not to exceed: | 18.542 mm |
| Outside Jacket, Tinned Copper Braid Shield, minimum: | 80% |
| Pulling tension, maximum: | 227 kg |
| Overall Cable, Outside Jacket: | Black Thermoplastic Elastomer |

Coax Cable

| | |
|-------------------------------------------|--------------------|
| Coax Tinned Copper Braid Shield, minimum: | 95% |
| Coax Insulation Material: | Solid Polyethylene |
| Coax Core Outside Diameter: | 3.073 mm |
| Coax Outside Diameter: | 4.521 mm |
| Coax Outside Jacket: | Cotton Braid |

Single Cable - Shielded group of 3 No. 18 AWG and with a group of 4#22 AWG inside cables. The individual conductors shall be color coded with PVC insulation.

Drain Wire, shall be provided for each group of cables.

| COAX CABLE - | |
|-----------------------------------------|-----------------|
| Nominal Impedance: | 75 Ω |
| Nominal Capacitance: | 70.54 pF/m |
| Nominal Velocity of Propagation: | 66% |
| Nominal Delay: | 5.05 ns/m |
| Attenuation | |
| @ 1 MHz | 0.0197 dB/m |
| @ 5 MHz | 0.0892 dB/m |
| @ 10 MHz | 0.0971 dB/m |
| @ 50 MHz | 0.1263 dB/m |
| @ 100 MHz | 0.1673 dB/m |
| Dielectric Strength: | |
| Nominal Shield DC Resistance @ 20°C: | 0.01378 Ω/m |
| Nominal Conductor DC Resistance @ 20°C: | 0.32808 Ω/meter |
| Maximum Operating Voltage: | 300 V RMS |

| SHIELDED GROUP OF 3 #18 AWG CONDUCTORS- | |
|-----------------------------------------------------|-------------|
| Nominal Conductor DC Resistance @ 20°C: | 0.02133 Ω/m |
| Nominal Shield DC Resistance @ 20°C: | 0.03642 Ω/m |
| Nominal Capacitance (to Adj. conductors and Shield) | 292 pF/m |

| SHIELDED GROUP OF 4 #22 AWG CONDUCTORS- | |
|-----------------------------------------------------|-------------|
| Nominal Conductor DC Resistance @20°C: | 0.05151 Ω/m |
| Nominal Shield DC Resistance @20°C: | 0.03675 Ω/m |
| Nominal Capacitance (to Adj. conductors and Shield) | 230 pF/ m |

Control cable shall be routed from the CCTV camera assembly to the camera encoder and AC power inside the camera pole. Wiring shall run continuous from source to destination without splices.

Cable slack of not less than 1 m shall be provided for equipment movement at pull boxes, vaults or cabinets. The cable shall be secured and coiled neatly.

The cables and connectors shall be installed to allow the camera and lens to be disconnected without removing the environmental camera housing.

Connectors shall properly connect to the connector's supplied with the CCTV camera assembly, the camera encoder unit and AC power outlet. Interconnect wiring and connectors shall be supplied and installed.

Cable grip and J-hook shall be as shown in the contract plans.

Manufacturer's cut sheets or specifications data of all cable assemblies, including connectors with strain relief backshells, shall be submitted to the Engineer.

The Contractor shall be responsible for all testing and documentation required to establish approval and acceptance of the production, installation, and operation of these materials and equipment. A copy of the testing procedures and results shall be submitted to the Engineer for review and approval.

The camera cable assembly connector assignments for C1, C2 and C3 connectors are shown on the plans. C1, C2 and C3 connectors shall be the connectors specified or equal. All materials necessary to make the connectors functional shall be provided by the Contractor. All materials used to make the connectors shall be compatible and shall adhere to manufacturers recommendations.

For Connector 1, the connector type shall be compatible, either directly or via adapter, with male AMP 206044-1 of existing field cameras .

| CONNECTOR C4 ASSIGNMENT | | | |
|-------------------------|-----------------------|------------|------------|
| PIN | FUNCTION | WIRE COLOR | WIRE GAUGE |
| Blade | Camera Power, AC Low | White | 18 AWG |
| Blade | Camera Power, AC High | Black | 18 AWG |
| Ground | Camera Power, Ground | Green | 18 AWG |

10-3.32 BONDING AND GROUNDING

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in conduits, except when the conduits contain combinations of only loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits, except for series lighting circuits, where No. 6 bare copper wire shall run continuously. The bonding wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

10-3.33 SERVICE

Type III service equipment enclosures shall be the aluminum type.

Circuit breakers shall be the cable-in/cable-out type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

Each service shall be provided with up to 2 main circuit breakers which shall disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of 2 circuit breakers as shown on the plans or required in the special provisions, each of the circuit breakers shall have a minimum interrupting capacity of 10 000 A, rms.

Circuit breakers used as service disconnect equipment shall have a minimum interrupting capacity of 42 000 A, rms, for 120/240 V(ac) .

ELECTRIC SERVICE (IRRIGATION)

Electric service (irrigation) shall be from the service points to the irrigation controllers (IC) and to the spaces provided in the irrigation controller enclosure cabinets (CEC) for irrigation controllers as shown on the plans.

10-3.34 NUMBERING ELECTRICAL EQUIPMENT

Self-adhesive numbers (with reflective sheet background) will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

The numbers shall be placed on the equipment where designated by the Engineer.

Where new numbers are to be placed on existing or relocated equipment, the existing numbers shall be removed.

Numbers shall be applied to a clean surface.

Where shown on the plans, equipment numbers shall be placed for all electroliers, soffit lighting, sign lighting, and service equipment enclosures. On service equipment enclosures, the numbers shall be placed on the front door. On electroliers, the numbers shall be placed as shown on the plans, except that the numbers shall be placed on the side nearest the roadway facing approaching traffic at a height up to 2.5-m above the base plate.

Numbers for illuminated signs mounted on overcrossings or for soffit luminaires shall be placed on the nearest adjacent bent or abutment at approximately the same station as the sign or soffit luminaire. Where no bent or abutment exists near the sign or soffit luminaire, the number shall be placed on the underside of the structure adjacent to the sign or soffit luminaire. Arrangement of numbers shall be the same as those used for electroliers.

Numbers for overhead sign bridges shall be placed on both posts.

Numbers for wood poles shall be 75-mm embossed aluminum fastened to the pole with 30-mm aluminum nails. Numbers for wood poles shall be furnished by the Contractor.

10-3.35 STATE-FURNISHED CONTROLLER ASSEMBLIES

The Model 170 controller assemblies, including controller unit, completely wired controller cabinet, battery backup system and inductive loop detector sensor units, but without anchor bolts, video detection unit or batteries for battery back up system will be State-furnished as provided under "Materials" of these special provisions.

The Contractor shall construct each controller cabinet foundation as shown on the plans for Model 332 and 334 cabinets (including furnishing and installing anchor bolts), shall install the controller cabinet on the foundation, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each State-furnished controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

State forces will maintain controller assemblies. The Contractor's responsibility for controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

10-3.36 VEHICLE SIGNAL FACES AND SIGNAL HEADS

Type SV-1-T mountings with 5 sections and SV-2-TD mountings shall be bolted to the standard through the upper pipe fitting in the same manner shown for bolting the terminal compartment.

Pipe fittings shall not be the aluminum type.

10-3.37 LIGHT EMITTING DIODE SIGNAL MODULE

Traffic signal faces with 300-mm sections, 200-mm sections or arrow sections shall use light emitting diode (LED) signal modules as the light source in conformance with these special provisions. Incandescent lamps in existing traffic signal faces shall be replaced with LED signal modules as shown on the plans and in conformance with these special provisions.

GENERAL

Type 1 LED signal modules shall be installed in the doorframes of standard traffic signal housings. Lamp sockets, reflectors, reflector holders and lenses used with incandescent lamps shall not be used when Type 1 LED signal modules are installed.

LED signal modules, including green, yellow, red, circular balls and arrow indications shall be from the same manufacturer, and each size shall be the same model.

Type 1 LED signal modules shall be sealed units with two color-coded conductors for power connection, a printed circuit board, a power supply, a lens and a gasket. LED signal modules shall be weatherproof after installation and connection. Circuit boards and power supplies shall be contained inside Type 1 LED signal modules. Circuit boards shall conform to the requirements in Chapter 1, Section 6 of the "Transportation Electrical Equipment Specifications," (TEES) published by the Department.

Conductors for Type 1 LED signal modules shall be one meter in length with quick disconnect terminals attached, and shall conform to the provisions in Section 86-4.01C, "Electrical Components," of the Standard Specifications.

Lenses of Type 1 LED signal modules shall be integral to the units, shall be convex with a smooth outer surface and shall be made of ultraviolet (UV) stabilized plastic or glass. The lenses shall be capable of withstanding ultraviolet exposure from direct sunlight for a minimum period of 36 months without exhibiting evidence of deterioration.

Type 1 LED signal modules shall be sealed in doorframes with one-piece ethylene propylene rubber (EPDM) gaskets.

LEDs used in signal modules shall be of Aluminum Indium Gallium Phosphide (AlInGaP) technology for red and yellow indications and of Gallium Nitride (GaN) technology for green indications. LEDs shall be the ultra bright type rated for 100,000 hours of continuous operation from -40°C to +74°C.

Individual LEDs shall be wired so that a total failure of one LED will result in the loss of not more than 5 percent of the signal module light output. Failure of an individual LED in a string shall not result in the loss of the entire string or any other indication.

Maximum power consumption requirements for LED signal modules shall be as follows:

| LED Signal Module | Power Consumption in Watts | | | | | |
|-------------------|----------------------------|------|--------|------|-------|------|
| | Red | | Yellow | | Green | |
| | 25°C | 74°C | 25°C | 74°C | 25°C | 74°C |
| 300 mm circular | 11 | 17 | 22 | 25 | 12 | 12 |
| 200 mm circular | 8 | 13 | 13 | 16 | 10 | 10 |
| 300 mm arrow | 9 | 12 | 10 | 12 | 13 | 13 |

PHYSICAL AND MECHANICAL REQUIREMENTS

Installation of LED signal modules shall only require the removal of the optical unit components such as the lens, lamp module, gaskets and reflector. LED signal modules shall be weather tight, fit securely to the housing and connect directly to electrical wiring.

Arrow modules shall conform to the requirements in Section 9.01 of the Institute of Transportation Engineers (ITE) Publication: Equipment and Materials Standards, "Vehicle Traffic Control Signal Heads" for arrow indications. LEDs shall be spread evenly across the illuminated portion of the arrow area.

LED Signal Module Lens

The LED signal module shall be capable of replacing the optical unit. The lens may be tinted or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. The use of tinting or other materials to enhance "ON/OFF" contrast shall not affect chromaticity and shall be uniform across the face of the lens.

If a polymeric lens is used, a surface coating or chemical surface treatment shall be used to provide front surface abrasion resistance.

Environmental Requirements

LED signal modules shall be rated for use in the operating temperature range of -40°C to +74°C.

LED signal modules shall be protected against dust and moisture intrusion in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures to protect internal components.

Construction

LED signal modules shall be single, self-contained devices, not requiring on-site assembly for installation into existing traffic signal housings. The power supply for LED signal modules shall be integral to the module.

Assembly and manufacturing processes for LED signal modules shall be designed to assure all internal components will be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Materials

Materials used for lenses and LED signal modules shall conform to the requirements in ASTM Specifications for the materials.

Enclosures containing the power supply or electronic components of LED signal modules shall be made of UL94VO flame-retardant materials. Lenses of LED signal modules are excluded from this requirement.

Module Identification

LED signal modules shall have the manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics permanently marked on the back of the module. Required operating characteristics shall include rated voltage, power consumption and volt-ampere (VA).

Type 1 LED signal modules shall have prominent and permanent vertical markings for correct indexing and orientation within the signal housings. Markings shall consist of an up arrow or the word "UP" or "TOP."

PHOTOMETRIC REQUIREMENTS

Initial luminous intensity values for LED signal modules, operating at 25°C, shall meet or exceed the following minimum values:

| Circular Indications (in cd) | | | | | | |
|------------------------------|--------|--------|-------|--------|--------|-------|
| Angle (v,h) | 200 mm | | | 300 mm | | |
| | 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 |

| Arrow Indications (in cd/m ²) | | | |
|-------------------------------------------|------|--------|--------|
| | Red | Yellow | Green |
| Arrow Indication | 5500 | 11 000 | 11 000 |

LED signal modules shall meet or exceed the following minimum illumination values for a minimum period of 36 months, based on normal use in traffic signal operation over an operating temperature range of -40°C to +74°C. In addition, yellow LED signal modules shall meet or exceed the following minimum illumination values for a minimum period of 36 months, based on normal use in traffic signal operation at 25°C:

| Circular Indications (in cd) | | | | | | |
|------------------------------|--------|--------|-------|--------|--------|-------|
| Angle (v,h) | 200 mm | | | 300 mm | | |
| | 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 |

| Arrow Indications (in cd/m ²) | | | |
|-------------------------------------------|-------|--------|--------|
| | Red | Yellow | Green |
| Arrow Indication | 5 500 | 11 000 | 11 000 |

Measured chromaticity coordinates of LED signal modules shall conform to the chromaticity requirements of the following table, for a minimum period of 36 months, over an operating temperature range of -40° C to +74° C.

| Chromaticity Standards | |
|------------------------|----------------------------------------------------------------------------------------|
| 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 less 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 modules tested or submitted for testing shall be representative of typical production units. Circular LED modules shall be tested in conformance with California Test 604. Optical testing shall be performed with LED signal modules mounted in standard traffic signal sections without visors or hoods attached to the signal sections.

LEDs for arrow indications shall be spread evenly across the illuminated portion of the arrow area. Arrow LED signal modules shall be tested in conformance with California Test 3001. Optical testing shall be performed with LED signal modules mounted in standard traffic signal sections without visors or hoods attached to the signal sections. LED arrow signal section indication shall provide minimum initial luminous intensity as listed herein. Measurements shall be performed at the rated operating voltage of 120 V (ac).

ELECTRICAL

Maximum power consumption requirements for LED signal modules shall not exceed those listed in "General." LED signal modules shall operate at a frequency of 60 Hz ± 3 Hz over a voltage range from 95 V (ac) to 135 V (ac) without perceptible flicker. Fluctuations of line voltage shall have no visible effect on luminous intensity of the indications. Rated voltage for all measurements shall be 120 V (ac).

Wiring and terminal blocks shall conform to the requirements of Section 13.02 of the ITE Publication: Equipment and Material Standards, (Vehicle Traffic Control Signal Heads). Two secured, color coded, 1 meter long, 600 V, 20 AWG minimum, jacketed wires, conforming to the National Electronic Code, rated for service at +105°C, shall be provided for electrical connection for each Type 1 LED signal module.

LED signal module on-board circuitry shall include voltage surge protection to withstand high repetition noise transients in conformance with the requirements in Section 2.1.6 of NEMA Standard TS2-1992.

LED signal modules shall be operationally compatible with currently used controller assemblies including solid state load switches, flashers and conflict monitors. When a current of 20 milliamperes (ac) or less is applied to the unit, the voltage read across the two leads shall be 15 V (ac) or less.

LED signal modules and associated on-board circuitry shall conform to the requirements in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

LED signal modules shall 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 modules shall not exceed 20 percent at an operating temperature of 25°C.

QUALITY CONTROL PROGRAM

LED signal modules shall be manufactured in conformance with a vendor quality control (QC) program. The QC program shall include two types of testing: (1) design qualification and (2) production quality. Production quality testing shall include statistically controlled routine tests to ensure minimum performance levels of LED signal modules built to meet these specifications.

Documentation of the QC process and test results shall be kept on file for a minimum period of seven years.

LED signal module designs not satisfying design qualification testing and the production quality testing performance requirements specified herein shall not be labeled, advertised or sold as conforming to these specifications.

Identification of components and subassemblies of LED signal modules, which may affect reliability and performance, shall be traceable to the original manufacturers.

Design Qualification Testing

Design qualification testing (DQT) shall be performed by the manufacturer or an independent testing lab hired by the manufacturer on new LED signal module designs, and on existing designs when a major design change has been implemented. Failure to conform to the requirements of any design qualification test shall be cause for rejection.

A major design change is defined as a design change, electrical or physical, which changes any of the performance characteristics of the LED signal module, results in a different circuit configuration for the power supply, or changes the layout of the individual LEDs in the signal module.

Two LED modules for each design shall be used for DQT. The two LED signal modules shall be selected at random. These signal modules shall be submitted to the Transportation Laboratory after the DQT is complete. Testing data shall be submitted with the modules to the Transportation Laboratory for verification of DQT data.

LED signal modules shall be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of 74°C before performing any DQT.

After burn-in, LED signal modules shall be tested for rated initial luminous intensity in conformance with the provisions in "Photometric Requirements." Before measurement, LED signal modules shall be energized at rated voltage, with 100 percent on-time duty cycle, for a time period of 30 minutes. Photometrics, luminous intensity and color measurements for yellow LED signal modules shall be taken immediately after the modules are energized. The ambient temperature for these measurements shall be 25°C. Test results for this testing shall record the current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement.

LED signal modules shall be tested by measuring for chromaticity (color) in conformance with the provisions in "Photometric Requirements." A spectra radiometer shall be used for this measurement. The ambient temperature for this measurement shall be 25°C.

LED signal modules shall be tested by measuring the current flow in amperes. The measured current values shall be used for quality comparison of production quality assurance on production modules.

LED signal modules shall be tested by measuring the power factor. A commercially available power factor meter may be used to perform this measurement.

LED signal modules shall be tested by measuring the total harmonic distortion. A commercially available total harmonic distortion meter may be used to perform this measurement.

LED signal modules shall be tested in conformance with the provisions in "Electrical," with reference to Class A emission limits referenced in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15.

LED signal modules shall be tested for compatibility with the controller unit, conflict monitor and load switch. Each signal module shall be connected to the output of a standard load switch connected to an alternating current voltage supply

between the values of 95 and 135 V (ac) with the input to the load switch in the "OFF" position. The alternating current voltage developed across each LED signal module so connected shall not exceed 15 V rms as the input alternating current voltage is varied from 95 V (ac) rms to 135 V (ac) rms.

LED signal modules shall be tested for transient immunity in conformance with the provisions in "Electrical," and conforming to the procedure described in NEMA Standard TS2-1992.

Mechanical vibration testing shall be performed on LED signal modules in conformance with the requirements in MIL-STD-883, Test Method 2007, using three 4-minute cycles along each x, y, and z axis, at a force of 2.5 Gs, with a frequency sweep from 2 Hz to 120 Hz. The loosening of the lens, internal components, or other physical damage shall be cause for rejection.

Temperature cycling shall be performed on LED signal modules in conformance with the requirements of MIL-STD-883, Test Method 1010. The temperature range shall conform to the provisions in "Environmental Requirements." A minimum of 20 cycles shall be performed with a 30 minute transfer time between temperature extremes and a 30 minute dwell time at each temperature. LED signal module under test shall be non-operating. Failure of LED signal modules to function properly or evidence of cracking of LED signal module lenses or housings after temperature cycling shall be cause for rejection.

Moisture resistance testing shall be performed on LED signal modules in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

Production Quality Testing

Production quality testing shall be performed on each LED signal module prior to shipment. Failure to conform to the requirements of any production quality test shall be cause for rejection. The manufacturer shall retain test results for seven years for warranty purposes.

LED signal modules shall be tested for rated initial intensity after burn-in. The burn-in period shall consist of signal modules being energized at rated voltage for a 30 minute stabilization period before the measurements are made. A single point measurement with a correlation to the minimum initial luminous intensity requirements of "Photometric Requirements" for circular modules may be used. The ambient temperature for this measurement shall be +25°C.

LED signal modules shall be tested for luminous intensity requirements in "Photometric Requirements."

LED signal modules shall be tested for required power factor after burn-in.

LED signal modules shall be tested by measuring current flow in amperes after burn-in. The measured current values shall be compared against current values resulting from design qualification measurements under "Design Qualification Testing." The current flow shall not exceed the rated value. The measured ampere values with rated voltage shall be recorded as volt-ampere (VA) on the product labels.

LED signal modules shall be visually inspected for any exterior physical damage or assembly anomalies. The surface of the lens shall be free of scratches, abrasions, cracks, chips, discoloration, or other defects. Any such defects shall be cause for rejection.

CERTIFICATE OF COMPLIANCE

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the LED signal modules comply with the requirements of these specifications. The certificate shall also include a copy of all applicable test reports on the LED signal modules.

QUALITY ASSURANCE TESTING (RANDOM SAMPLE TESTING)

The State may perform random sample testing on all shipments. Random sample testing will be completed within 30 days after delivery to the Transportation Laboratory. Circular LED signal modules shall be tested in conformance with California Test 604 and these special provisions. Arrow signal modules shall be tested in conformance with California Test 3001 and these special provisions. Optical testing shall be performed with the module mounted in a standard traffic signal section, but without a visor or hood attached to the section or housing. The number of modules tested shall be determined by the quantity of each model in the shipment. The sample size shall conform to ANSI/ASQC Z1.4. The Transportation Laboratory shall determine the sampling parameters to be used for the random sample testing. All parameters of the specification may be tested on the modules. Acceptance or rejection of the shipment shall conform to ANSI/ASQC Z1.4 for random sampled shipments.

WARRANTY

The manufacturer shall provide a written warranty against defects in materials and workmanship for LED signal modules for a period of 36 months after installation of LED signal modules. Replacement LED signal modules shall be provided within 5 days after receipt of failed LED signal modules at no cost to the State, except the cost of shipping the failed modules. All warranty documentation shall be given to the Engineer prior to installation. Replacement LED signal modules shall be delivered to Caltrans Maintenance Electrical Shop at the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

10-3.38 BATTERY BACKUP SYSTEM

DESCRIPTION

The battery back up system (BBS) shall consist of an external cabinet, an inverter/charger, a power transfer relay, a manual bypass switch, a temperature probe, hardware, a battery harness, and interconnect wiring. The BBS will be State-furnished as provided under "Materials" of these special provisions. The Contractor shall furnish the batteries.

A completely assembled, wired BBS and external cabinet will be State-furnished as provided under "Materials" of these special provisions. The Contractor shall construct the BBS extended foundation. The Contractor shall install the batteries, and connect the battery wiring harness.

MATERIAL

The Contractor shall furnish batteries compatible with the State-furnished BBS and suitable for outdoor applications. Batteries shall:

- A. have voltage rating 12 V,
- B. be group size 24,
- C. be 75 to 80 ampere-hour at 20 hour rate,
- D. be commercially available and stocked locally,
- E. have a carrying handle,
- F. be marked with date code and maximum recharge data and recharge cycles,
- G. have 2 top mounted terminal posts with recessed thread lugs for 6.35 mm diameter, 20 thread count per 25.4 mm bolts,
- H. be fully charged when furnished, and
- I. be free from damage or deformities.

The Contractor shall provide 4 batteries per BBS installation.

The batteries shall be deep cycle, sealed prismatic lead-calcium based absorbed glass mat/valve regulated lead acid (AGM/VRLA).

The batteries shall be certified by the manufacturer to operate over a temperature range of -25°C to 74°C.

The Contractor shall submit the battery data sheet to the Engineer when the batteries are delivered to the jobsite. The data sheet shall include the following features:

- A. model number,
- B. serial number,
- C. dimensions,
- D. charts,
- E. table of discharge rating,
- F. product information,
- G. battery specifications, and
- H. conductivity reading per battery (in Siemens).

The batteries shall have a written warranty against defects in materials and workmanship from the manufacturer prorated for a period of 60 months after installation. The Contractor shall provide the Engineer with all warranty documentation prior to installation. Replacement batteries shall be provided within 5 days after receipt of failed batteries at no cost to the State except the cost of shipping the failed batteries. Replacement batteries shall be delivered to Caltrans Maintenance Electrical Shop at the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

MOUNTING AND CONFIGURATION

Functional Testing

The BBS functional test shall include at least 30 minutes of continuous, satisfactory operation with utility power turned off. Testing will be performed in the presence of the Engineer.

10-3.39 LIGHT EMITTING DIODE PEDESTRIAN SIGNAL FACE MODULES

Light emitting diode (LED) pedestrian signal face (PSF) modules shall be installed in standard Type A pedestrian signal housing, "UPRAISED HAND" and "WALKING PERSON," and shall use light emitting diodes as the light source as shown on the plans and in conformance with these special provisions.

GENERAL

PSF modules shall be designed to mount in standard Type A housings. PSF modules shall be designed to mount behind or replace face plates of standard Type A housings in conformance with the requirements of the Institute of Transportation Engineers (ITE) Standards: "Pedestrian Traffic Control Signal Indications" and the "California MUTCD." Where existing Type A pedestrian signal faces contain both incandescent and LED light sources, both light sources shall be removed and replaced by a new LED pedestrian signal face module in conformance with these special provisions.

PSF modules used on this project shall be from a single manufacturer.

Circuit boards and power supplies shall be contained inside the LED modules. Circuit boards shall conform to the requirements in Chapter 1, Section 6 of the "Transportation Electrical Equipment Specifications," (TEES) published by the Department.

PSF modules shall fit into existing Type A housings and shall not require a specific mounting orientation and shall not vary in light output, pattern or visibility for any mounting orientation.

LEDs for "UPRAISED HAND" symbols shall utilize Aluminum Indium Gallium Phosphide (AlInGaP) technology and shall be the ultra bright type rated for 100,000 hours of continuous operation from -40°C to +74°C.

Individual LEDs shall be wired so that a total failure of one LED will result in the loss of not more than 5 percent of the PSF module light output. Failure of an individual LED in a string shall not result in the loss of the entire string or any other indication.

PSF modules tested and those submitted for testing shall be representative of typical production units. PSF modules shall be tested in conformance with California Test 610 and as specified herein.

Luminance Requirements

Luminance of the "UPRAISED HAND" symbol shall be 3750 cd/m² minimum. Color of "UPRAISED HAND" shall be Portland orange conforming to the requirements of the ITE Standards: "Pedestrian Traffic Control Signal Indications" and the "California MUTCD."

Luminance of the "WALKING PERSON" symbol shall be 5300 cd/m² minimum. Color of "WALKING PERSON" shall be white (Luminous Tubing) conforming to the requirements of the ITE Standards: "Pedestrian Traffic Control Signal Indications" and the "California MUTCD."

Height and width of each symbol shall not be less than 250 mm and 165 mm respectively. Uniformity ratio of illuminated symbols shall not exceed 4 to 1 between the highest luminance area and the lowest luminance area.

PSF modules shall be rated for a minimum useful life of 36 months and shall maintain at least 85 percent of 3750 cd/m² for "UPRAISED HAND" symbols and 85 percent of 5300 cd/m² for "WALKING PERSON" symbols after 36 months of continuous use in traffic signal operation over a temperature range of -40°C to +74°C.

Physical and Mechanical Requirements

PSF modules shall be designed as retrofit replacement for existing optical units of signal lamps, or existing pedestrian signal faces with both LED and incandescent light sources, and shall not require special tools for installation. PSF modules shall fit into pedestrian signal section housings built in conformance with the ITE Publication: Equipment and Materials Standards, Chapter 2 "Vehicle Traffic Control Signal Heads" (VTCSH) without modification to the housing.

Installation of PSF modules into pedestrian signal faces shall require only removal of lenses, reflectors, lamps and existing LED modules as indicated on the plans.

Environmental Requirements

PSF modules shall be rated for use in the operating temperature range of -40°C to +74°C.

Construction

PSF modules shall be single, self-contained devices, not requiring on-site assembly for installation into standard Type A housings. Power supplies for PSF modules shall be integral to the modules.

Assembly and manufacturing processes for PSF modules shall be designed to assure all internal components will be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Materials

Material used for PSF modules shall conform to the requirements in ASTM specifications for the materials.

Enclosures containing either the power supply or electronic components of the PSF module shall be made of UL94VO flame-retardant materials.

Module Identification

PSF modules shall have the manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics permanently marked on the back of the module. Required operating characteristics shall include rated voltage, power consumption and volt-ampere (VA).

Type A pedestrian signal face, combination "UPRAISED HAND"/"WALKING PERSON" section, housings without the reflectors shall be used for PSF modules.

PHOTOMETRIC REQUIREMENTS

PSF modules shall maintain at least 85 percent of the following luminous intensity values over 36 months of continuous use in signal operation over the temperature range of -40°C to $+74^{\circ}\text{C}$. In addition, PSF modules shall meet or exceed the following luminous intensity values upon initial testing at 25°C .

| PSF module | Luminous Intensity |
|----------------|------------------------|
| UPRAISED HAND | 3750 cd/m ² |
| WALKING PERSON | 5300 cd/m ² |

The measured chromaticity coordinates of PSF modules shall conform to the requirements for chromaticity in Section 5.3.2.1 and Figure C of the VTCSH standards.

ELECTRICAL

PSF module power consumption shall not exceed the following maximum values:

| PSF module | Power Consumption
@ 25°C | Power Consumption
@ 74°C |
|----------------|-----------------------------|-----------------------------|
| UPRAISED HAND | 10.0 W | 12.0 W |
| WALKING PERSON | 12.0 W | 15.0 W |

PSF modules shall operate at a frequency of 60 Hz \pm 3 Hz over a voltage range from 95 V (ac) to 135 V (ac) without perceptible flicker. Fluctuations of line voltage shall have no visible effect on the luminous intensity of the indications. Rated voltage for all measurements shall be 120 V (ac).

PSF module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients in conformance with the requirements in Section 2.1.6 of NEMA Standard TS2-1992.

Wiring and terminal blocks shall conform to the requirements of Section 13.02 of the ITE Publication: Equipment and Material Standards, "Vehicle Traffic Control Signal Heads."

PSF modules shall be operationally compatible with currently used controller assemblies including solid state load switches, flashers and conflict monitors. When a current of 20 milliamperes (ac) or less is applied to the unit, the voltage read across the two leads shall be 15 V (ac) or less.

PSF modules and associated on-board circuitry shall conform to the requirements in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

PSF modules shall provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by PSF modules shall not exceed 20 percent at an operating temperature of 25°C.

QUALITY CONTROL PROGRAM

PSF modules shall be manufactured in conformance with a vendor quality control (QC) program. The QC program shall include two types of testing: (1) design qualification and (2) production quality. Production quality testing shall include statistically controlled routine tests to ensure minimum performance levels of PSF modules built to meet these specifications.

Documentation of the QC process and test results shall be kept on file for a minimum period of seven years.

PSF module designs not satisfying design qualification testing and the production quality testing performance requirements specified herein shall not be labeled, advertised or sold as conforming to these specifications.

Identification of components and subassemblies of PSF modules, which may affect reliability and performance, shall be traceable to the original manufacturers.

Design Qualification Testing

Design qualification testing (DQT) shall be performed by the manufacturer or an independent testing lab hired by the manufacturer on new PSF module designs, and on existing designs when a major design change has been implemented. Failure to conform to the requirements of any design qualification test shall be cause for rejection.

A major design change is defined as a design change, electrical or physical, which changes any of the performance characteristics of the PSF module, results in a different circuit configuration for the power supply, or changes the layout of the individual LEDs in the PSF module.

Two PSF modules for each design shall be used for DQT. The two PSF modules shall be selected at random. These PSF modules shall be submitted to the Transportation Laboratory after the DQT is complete. The testing data shall be submitted with the PSF modules to the Transportation Laboratory for verification of DQT data.

The PSF modules shall be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of 74 °C before performing any DQT.

After burn-in, the PSF modules shall be tested for rated initial luminous intensity in conformance with the provisions in "Photometric Requirements." Before measurement, PSF modules shall be energized at rated voltage, with 100 percent on-time duty cycle, for a time period of 30 minutes. The ambient temperature for these measurements shall be 25 °C. The test results shall include the recorded current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement.

PSF modules shall be tested by measuring for chromaticity (color) in conformance with the provisions in "Photometric Requirements." A spectra radiometer shall be used for these measurements. The ambient temperature for these measurements shall be 25 °C.

PSF modules shall be tested by measuring for current flow in amperes. The measured current values shall be used for comparison of production quality assurance on production modules.

PSF modules shall be tested by measuring for power factor. A commercially available power factor meter may be used to perform this measurement.

PSF modules shall be tested by measuring for total harmonic distortion. A commercially available total harmonic distortion meter may be used to perform this measurement.

PSF modules shall be tested in conformance with the provisions in "Electrical," with reference to Class A emission limits referenced in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15.

PSF modules shall be tested for compatibility with the controller unit, conflict monitor and load switch. Each PSF module shall be connected to the output of a standard load switch connected to an alternating current voltage supply between the values of 95 and 135 V (ac) with the input to the load switch in the "OFF" position. The alternating current voltage developed across each PSF module shall not exceed 10 V rms as the input alternating current voltage is varied from 95 V (ac) rms to 135 V (ac) rms.

PSF modules shall be tested for transient immunity in conformance with the provisions in "Electrical" and conforming to the procedure described in NEMA Standard TS2-1992.

Mechanical vibration testing shall be performed on PSF modules in conformance with the requirements in MIL-STD-883, Test Method 2007, using three 4-minute cycles along each x, y, and z axis, at a force of 2.5 Gs, with a frequency sweep from 2 Hz to 120 Hz. The loosening of the lens, of any internal components, or other physical damage shall be cause for rejection.

Temperature cycling shall be performed on PSF modules in conformance with the requirements of MIL-STD-883, Test Method 1010. The temperature range shall conform to the provisions in "Environmental Requirements." A minimum of 20 cycles shall be performed with a 30 minute transfer time between temperature extremes and a 30 minute dwell time at each temperature. Signal under test shall be non-operating. Failure of PSF modules to function properly or evidence of cracking of PSF module lenses or housings after temperature cycling shall be cause for rejection.

Moisture resistance testing shall be performed on PSF modules in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

Production Quality Testing

Production quality tests shall be performed on each PSF module prior to shipment. Failure to conform to the requirements of any production quality tests shall be cause for rejection. The manufacturer shall retain test results for seven years for warranty purposes.

PSF modules shall be tested for rated initial intensity after burn-in. The burn-in period shall consist of signal modules being energized at rated voltage for a 30 minute stabilization period before the measurements are made.

PSF modules shall be tested for luminous intensity requirements in "Photometric Requirements."

PSF modules shall be tested for required power factor after burn-in.

PSF modules shall be tested by measuring current flow in amperes after burn-in. The measured current values shall be compared against current values resulting from design qualification measurements under "Design Qualification Testing." The current flow shall not exceed the rated value. The measured ampere values with rated voltage shall be recorded as volt-ampere (VA) on the product labels.

PSF modules shall be visually inspected for any exterior physical damage or assembly anomalies. The surface of the lens shall be free of scratches, abrasions, cracks, chips, discoloration, or other defects. Any such defects shall be cause for rejection.

CERTIFICATE OF COMPLIANCE

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the PSF modules comply with the requirements of these specifications. The certificate shall also include a copy of all applicable test reports on the PSF modules.

QUALITY ASSURANCE TESTING (RANDOM SAMPLE TESTING)

The State may perform random sample testing on all shipments. Random sample testing will be completed within 30 days after delivery to the Transportation Laboratory. PSF modules shall be tested in conformance with California Test 606 and these special provisions. Optical testing shall be performed with the module mounted in a standard traffic signal section or in a standard Type A pedestrian housing, but without a visor or hood attached to the section or housing. The number of modules tested shall be determined by the quantity of each model in the shipment. The sample size shall conform to ANSI/ASQC Z1.4. The Transportation Laboratory shall determine the sampling parameters to be used for the random sample testing. All parameters of the specification may be tested on the modules. Acceptance or rejection of the shipment shall conform to ANSI/ASQC Z1.4 for random sampled shipments.

WARRANTY

The manufacturer shall provide a written warranty against defects in materials and workmanship for the PSF modules for a period of 36 months after installation of the PSF modules. Replacement PSF modules shall be provided within 5 days after receipt of failed PSF modules at no cost to the State, except the cost of shipping the failed modules. All warranty documentation shall be given to the Engineer prior to installation. Replacement PSF modules shall be delivered to Caltrans Maintenance Electrical Shop at the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

10-3.40 CLOSED CIRCUIT TELEVISION CAMERA ASSEMBLY

Closed circuit television (CCTV) camera assembly shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

GENERAL

Prototype equipment will not be allowed. All equipment shall be current standard production units.

The CCTV camera assembly shall consist of the following components:

- A. Camera
- B. Motorized zoom lens
- C. Environmental enclosure with sun shield or shroud
- D. Pan/tilt drive unit
- E. Iris control circuit devices
- F. AC step-down transformer

The CCTV camera assembly shall have all necessary wiring, cables, and connectors. All CCTV camera assemblies shall be plug compatible, interchangeable and suitable for use with the CCTV camera cable assembly described in these special provisions.

CAMERA

All cameras supplied shall meet the following specifications.

Performance

| PARAMETER | SPECIFICATION |
|-------------------------|--------------------------------------------------------|
| Optical Device | CCD, Color, interline transfer |
| Optical Ccd Format Size | 6.3 mm format |
| Horizontal Resolution | 460 television lines (minimum) |
| Sensitivity | 1 lux @ 1/60 s shutter speed (measured with fl.6 lens) |
| Scanning System | 525 lines 2:1 interlace |

Closed circuit television camera assembly components shall be rated for NEMA 4X, IP 66 or IP 67.

The camera shall be equipped with an electronic shutter with adjustable speeds ranging from 1/60 second to 1/30,000 second.

Electrical

| PARAMETER | SPECIFICATION |
|------------------------------------------------|------------------------------------------------|
| Operating Voltage | 120 V(ac) \pm 10% (external adapter allowed) |
| Power Consumption | 50 W (Maximum) |
| Video Output Signal | Standard NTSC color TV |
| Video Output Connector | Standard BNC bulkhead on rear of camera |
| Signal To Noise Ratio | >48 dB |
| Synchronization | Internal sync or phase adjustable line lock |
| Video Output Level | 1.0 V p-p (75 Ω composite) |
| Gain Control | Automatic |
| Automatic Back Focus (Automatic White Balance) | Required |

Programming shall be stored non-volatile memory and the CCTV assembly shall be firmware updateable via serial communication.

Environmental

| PARAMETER | SPECIFICATION |
|-----------------------|--------------------------|
| Operating Temperature | -10°C to 50°C |
| Storage Temperature | -40°C to 60°C |
| Operating Humidity | 20 to 80% non-condensing |
| Storage Humidity | 20 to 90% non-condensing |

CLOSED CIRCUIT TELEVISION CAMERA LENS

The CCTV camera lens shall meet the following specifications.

| PARAMETER | SPECIFICATION |
|--------------------------------------------------|------------------------------------------------------------------|
| Format | 6.3 mm format |
| Iris | Motorized , with automatic and manual adjust modes |
| Operating temperature | -10°C to +50°C |
| Focal Length | Maximum not less than 80 mm
(Optical power not less than 21X) |
| Lens Aperture | F1.6 - F3.6 |
| Horizontal angle of view at Maximum Focal Length | Not less than 2.2° for 6.3 mm format camera |

The lens shall have motors for zoom, focus and iris.

The lens shall have capability for focus and zoom preset positions. A telescopic converter or extender shall not be used to achieve required focal length range.

Electrical

When the power is removed from the lens, the lens iris shall automatically close.

The motorized-iris cable shall be strain relieved or sufficiently rugged such that the cable will not fail at the point where it leaves the lens assembly.

Optical

When the camera is pointed at a very bright object and or when the camera and lens is first turned on, the image produced by the lens and camera combination shall not optically "oscillate" (i.e., produce an image that alternates from too light to too dark) or otherwise be unstable.

Each lens shall have an automatic, motor-driven iris with manual override.

The lens shall include mechanical or electrical means to protect the motors from over running in the extreme position.

The iris shall be controlled directly through the camera in automatic mode and from any keyboard connected into the camera system in the manual mode. The automatic iris shall provide continuous aperture adjustments of the lens as determined by the amount of light reaching the camera imager. The power supply and electronics for iris motor shall be contained within the environmental housing.

Environmental

| PARAMETER | SPECIFICATION |
|-----------------------|----------------------------------|
| Operating Temperature | -25.6°C to 50°C (minimum range). |
| Storage Temperature | -40°C to -10°C |
| Operating Humidity | 20 to 80% non-condensing |
| Storage Humidity | 20 to 90% non-condensing |

Installation

The Contractor shall make all the necessary adjustments on different components of the CCTV camera assembly. This includes the back-focus and tracking adjustments on the lens and color balancing of the camera.

The Contractor shall ensure the back-focus adjustment on the camera is such that the lens focus is properly set and maintained when adjusting the focal length from zoom to wide angle. The Contractor shall make this adjustment with the lens iris at full open position. This adjustment shall be made such that when the zoom is adjusted from long range (telephoto) to wide angle, no refocusing is necessary.

ENVIRONMENTAL ENCLOSURE

The environmental enclosure shall be the sealed, pressurized type, designed to withstand exposure to sand, dust, fungus, and salt atmosphere, and house the assembled camera, motorized zoom lens and all internal wiring. It shall operate on a voltage range of 120 V(ac) ±10 percent power source. The enclosure shall include an internal thermostatically controlled heater assembly to minimize external faceplate condensation. The Contractor has the option of providing a sealed, pressurized Integrated Optics Cartridge (IOC) housed in a NEMA 4X rated enclosure.

The enclosure shall include a sun shield or shroud to provide protection from direct solar radiation.

The enclosure or IOC shall be pressurized with 34 kPa dry nitrogen. The enclosure shall have a valve for pressurizing. In addition, a pressure relief valve with a 137 kPa rating shall be provided to protect the enclosure from overcharging.

The notation "CAUTION - PRESSURIZED" shall be printed on the enclosure. The letter height shall be at least 6.3 mm.

Performance

The housing unit shall have lens preset capabilities.

The housing shall not interfere with the widest viewing angle of the motorized zoom lens.

Physical

| PARAMETER | SPECIFICATION |
|-----------------|------------------------------------------------------------------|
| Construction | All aluminum |
| Finish | White, light beige or gray baked enamel or polyester powder coat |
| Weight | Less than 21 kg excluding heater |
| Camera Mounting | Platform mount with adjustment fore and aft |

The camera lens shall be positioned in the center of the housing window.

Any enclosure supplied shall include a sun shield or shroud to protect the housing from the direct rays of the sun. The sun shroud shall be made specifically for the model of enclosure that is selected.

Shock And Vibration

The camera enclosure shall not incur any physical damage after a shock, return to normal operation immediately and operate within the specified vibration (see Note 1 below table).

| PARAMETER | SPECIFICATION |
|-----------|-------------------------------------------------------------------------------|
| Shock | Up to 5 G while in non-operation mode |
| Vibration | 5-60 Hz with 2.1 mm total excursion, and 5 G rms vibration from 60 to 1000 Hz |

Note 1: Where the manufacturer's cut sheet or specification data does not contain shock and vibration data a listing of at least 2 project sites with identical equipment, with similar installation conditions and similar traffic patterns showing continuous functional performance of at least 2 years may be substituted.

Installation

The Contractor shall apply an approved weather-resistant spray to the inside of the connectors before engaging the connectors.

PAN AND TILT UNIT

The pan and tilt unit will consist of the pan and tilt unit itself along with any electrical or communication interfaces required to perform the functions specified. The pan and tilt unit shall be designed to operate under a full range of environmental conditions.

Performance

| PARAMETER | SPECIFICATION |
|------------------------------|-----------------------------------------------------------------------------------------------------|
| Braking: Pan And Tilt | Mechanical or Electrical to limit coast |
| Overload Protection | Motors: Impedance protected |
| Angular Travel | Pan: 0 to 355° Horizontal, Continuous
Tilt: +30° Up to -80° Down |
| Pan Speed | 0.1°/s to 40°/s variable-speed |
| Tilt Speed | 0.1°/s to 20°/s variable-speed |
| Pan And Tilt Position Preset | Positions camera to a predetermined azimuth, elevation and lens position
(Minimum of 64 Presets) |

Physical Specifications

| PARAMETER | SPECIFICATION |
|-------------------------------|---------------------------------------------------------------------------------|
| Pan & Tilt Worms | Ground and polished Stainless Steel |
| Pan & Tilt Worm Gears | Non-metallic material |
| Mounting (Base) | 178 mm ± 3.2 mm diameter bolt circle Check Plans |
| Camera Mount | Compatible with camera housing |
| Bearings on Rotating Surfaces | Heavy duty roller type |
| Overload Protection | Provided - internal |
| OPERATING TEMPERATURE | -23.3°C to 60°C |
| CONSTRUCTION | Corrosion resistant steel or aluminum |
| FINISH | Weather resistant paint or polyurethane |
| SEALS | “O” ring or gaskets for all weather protection of pan and tilt unit and cables. |

The pan and tilt unit with camera assembly mounted shall withstand a wind load of 129 km/h.

The cable connector shall be fully weather protected.

Access into pan/tilt for routine maintenance or adjustments shall not require removal of the pan and tilt from the installation site, nor removal of the camera enclosure from the pan/tilt unit. Access cover shall be readily removable regardless of the tilt position.

External body components shall be manufactured from aluminum that have been anodized, painted or coated to prevent oxidation and corrosion.

Pan And Tilt Stops

The pan and tilt unit shall have pan and tilt stops. The settings of these pan and tilt stops shall be determined by the Engineer.

Installation

The Engineer will notify the Contractor of the pan and tilt presets and stops for the pan and tilt unit for the Contractor to set prior to camera assembly installation check. Installation check shall be done by the Contractor in the presence of the Engineer. The test of the operation (zoom, iris, etc...) of the pan and tilt unit may be performed at the CCTV Cabinet adjacent to the camera or by remote keyboard location at the Contractor's option. The Contractor shall furnish a color video monitor, for testing only, to view the actual camera image. Upon completion of the installation, the Engineer will verify operation of the pan and tilt unit. Any additional adjustments necessary to restore the presets and stops to acceptable parameters shall be at the Contractor's expense.

The Contractor shall provide five copies of the operation and maintenance manuals for the pan and tilt unit.

OVERALL REQUIREMENTS

The complete unit, including the pan/tilt unit shall not exceed 199 mm wide x 442 mm high x 381 mm deep. Any external cables shall not interfere with or limit the continuous pan and tilt operation. The camera control protocol used by the camera assembly shall be either an open public domain protocol, Pelco D, or other protocol convertible to Pelco D via translator. All functions described shall be available using the described protocol. If a protocol other than Pelco D is proposed, the Contractor shall provide a version of Baxall's camera control software "PC Control" or latest equivalent version that includes the new protocol as a choice for the new camera locations. The version of camera control software shall not interfere with the operation of any other camera locations that use Pelco D. All camera control functions shall be through the RS-422 communications interface.

| |
|--------------------------|
| OPERATOR FUNCTIONS |
| Pan Right |
| Pan Left |
| Tilt Up |
| Tilt Down |
| Zoom In |
| Zoom Out |
| Focus Near |
| Focus Far |
| Iris Open |
| Iris Close |
| Iris Manual |
| Iris Auto |
| Pan Stop |
| Tilt Stop |
| Zoom Stop |
| Focus Stop |
| Iris Stop |
| |
| ADMINISTRATIVE FUNCTIONS |
| Status Query |
| Set Char. Display |
| Activate Char. Display |
| Blank Char. Display |
| Set Preset Position |
| Go to Preset Position |
| Set Relay |
| Reset Relay |
| Turn on Camera |
| Turn off Camera |
| Wiper on |
| Wiper off |
| Heater Control |

Camera Control and Configuration

The existing system keyboard is a BAXALL Keyboard Part Number ZKX3-J. A copy of the keyboard manual is available for review upon request.

Pan and Tilt Position Presets shall be programmable via the system keyboard.

The following operator basic functions shall be controlled via the system keyboard:

Pan Left, Pan Right and Pan Stop controlled by Joystick.

Tilt Up, Tilt Down and Tilt Stop controlled by Joystick.

Zoom In, Zoom Out and Zoom Stop controlled by Zoom In and Zoom Out button.

Focus Near, Focus Far and Focus Stop controlled by Near Focus and Far Focus button.

Iris Open, Iris Close and Iris Stop controlled by Open Iris and Close Iris button.

Camera selections made by numeric keypad on system keyboard.

Monitor selections made by numeric keypad on system keyboard.

The Stop actions for all Pan, Tilt, Zoom, Focus and Iris features will be issued once the Joystick, Zoom, Focus and Iris buttons are released.

The camera administrative functions shall be accessible via system keyboard or by software installed on a personal computer. If the software method is used, the camera manufacturers menu system may be used.

SYSTEM TESTING AND DOCUMENTATION

The Contractor shall be responsible for all testing and documentation required for approval and acceptance of the production, installation, and operation of these materials and equipment. The following identifies the specific quality control requirements for testing and documentation.

The Contractor shall test all cables after installation with connectors attached for continuity and shorts or grounds.

The Contractor shall adjust and set limit stops to the pan/tilt unit at each camera site to prevent the view of the areas outside of the roadway system. The final settings shall be approved by the Engineer.

The Contractor shall perform a local functional test at each of the CCTV locations. At the Contractor's option the test may be performed directly at the CCTV cabinet or remotely via keyboard or keyboard and personal computer. The Contractor shall demonstrate to the Engineer all the CCTV features. The Contractor shall provide all the test equipment.

The Contractor shall arrange to have a technician, qualified to work on the closed circuit television assembly and employed by the closed circuit television assembly manufacturer or the manufacturer's representative, present at the time the equipment is turned on.

The Contractor shall provide four sets of documentation containing complete specifications and operation details of each of the components of the CCTV camera assembly. The documentation shall also include wiring diagrams showing wire colors, functions, and pin assignments for connecting these components to each other and to the encoder.

PRE-ACCEPTANCE TESTING

Each closed circuit television system shall be subjected to tests as outlined herein. All testing will be performed by Department personnel, arranged by the Engineer, and in the presence of the Contractor. The Contractor shall notify the Engineer in writing fifteen days prior to the scheduled testing. The Contractor shall provide all necessary equipment required to access the CCTV equipment for testing.

CERTIFICATE OF COMPLIANCE

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the closed circuit television camera assembly complies with the requirements of these specifications. The certificate shall also include a copy of all applicable test reports on the closed circuit television camera assembly.

10-3.41 SERIAL TO ETHERNET CONVERSION UNIT

Serial to ethernet conversion unit (SECU) shall conform to the details shown on the plans and shall be in conformance with these special provisions.

Serial to ethernet conversion unit (SECU) shall have the following features:

| SERIAL TO ETHERNET CONVERSION UNIT (SECU) | |
|-------------------------------------------|--------------------------------------------------------------------------------------------------|
| FEATURE | PARAMETER/REMARKS |
| Support Protocols | ARP, UDP, TCP, Telnet, ICMP |
| Serial Device Support | Asynchronous, 7 or 8 bit with or without parity |
| Network Interface | Ethernet, 10BaseT |
| Network Connector | RJ45 |
| Serial Interface | RS232, RS422, RS485, DCE Configuration |
| Serial Interface Connector | DB25 Female |
| Data Rates | 300 bps to 115 Kbps,
Must transmit and receive 3600 bytes of serial data without interruption |
| Control Lines | RTS, CTS, DSR, DCD, DTR |
| DCD Control Line | Must frame data on receive line |
| Software Flow Control | XON, XOFF |
| Hardware Flow Control | CTS/RTS |
| Management | SNMP,
Local console port log in or Telnet log in,
Menu driven user selection |
| Indicators | Good Link, Network transmit/receive data,
RS232, Transmit/Receive Data |
| Indicator Type | LED |
| Operating Mode | Client or Server Unit |
| Client Mode | Communications up to 7 Server units on IP list |
| Client Mode Addressing | IP Addressable |
| Server Mode | Communicates with Client Unit |
| Dimensions (nominal) (HxWxD) | Maximum 23 mm x 64 mm x 90 mm |
| Operating Temperature | 5 to 50°C |
| Power | 110 V(ac), 10 W |

10-3.42 ETHERNET EXTENDER PROVIDER

Ethernet extender provider (EEP) shall conform to the details shown on plans and shall be in conformance with these special provisions.

Ethernet extender provider (EEP) unit shall operate as a pair with ethernet extender subscriber (EES) unit to extend 10/100Base T ethernet network signaling over a single twisted pair of conductors as shown on plans and shall have the following features:

| ETHERNET EXTENDER PROVIDER | |
|-----------------------------------|-------------------------------------------------------------------------------------------------|
| FEATURE | PARAMETER/REMARKS |
| Unit Designation | Ethernet Extender Provider |
| Unit Operability | Must work with Ethernet Extender Subscriber |
| Line Coding Standard | G.SHDSL |
| Minimum Line Rate | 2300 kbit/s at 1.7Km, AWG24 cat 5 cable |
| Data Rate Selection | DIP switch |
| G.SHDSL ports | 1 minimum |
| G.SHDSL connector | RJ11, RJ12 or RJ45 |
| G.SHDSL protocol | ITU G.991.2 |
| Network Ports | 10/100 Base-TX |
| Network Connector | RJ45 for 10/100 Base-TX Ethernet |
| Network Interface | Full Duplex/Half Duplex |
| | IEE 802.3 10BaseT Compliant |
| | IEE 802.3u 10BaseT Compliant |
| Protocol Support | TCP/IP, UDP/IP |
| Indicators | Power, "Good Ethernet Link", Ethernet Traffic, "Good SHDSL Link", "SHDSL connection initiation" |
| Indicator Type | LED |
| Dimensions (nominal) (HxWxD) | 35mm x 121mm x 119mm |
| Operating Temperature | 0 to 50 ⁰ C |
| Operation Voltage | 110V |
| Operating Current | Less than 1.0A at 110V |
| Weight | 0.3 kg |
| Relative Humidity | 5 to 95% relative humidity |
| Regulatory Compliance | EN 60950, EN 55024, FCC part 15, CSA 22.2 No. 60950 |
| Warranty | Three years |

10-3.43 ETHERNET EXTENDER SUBSCRIBER

Ethernet extender subscriber (EES) shall conform to the details shown on plans and shall be in conformance with these special provisions.

Ethernet extender subscriber (EES) unit shall operate as a pair with ethernet extender provider (EEP) unit to extend 10/100Base T ethernet network signaling over a single twisted pair of conductors as shown on plans and shall have the following features:

| ETHERNET EXTENDER SUBSCRIBER | |
|-------------------------------------|-------------------------------------------------------------------------------------------------|
| FEATURE | PARAMETER/REMARKS |
| Unit Designation | Ethernet Extender Provider |
| Unit Operability | Must work with Ethernet Extender Provider |
| Line Coding Standard | G.SHDSL |
| Minimum Line Rate | 2300 kbit/s at 1.7Km, AWG24 cat 5 cable |
| Data Rate Selection | DIP switch |
| G.SHDSL ports | 1 minimum |
| G.SHDSL connector | RJ11, RJ12 or RJ45 |
| G.SHDSL protocol | ITU G.991.2 |
| Network Ports | 10/100 Base-TX |
| Network Connector | RJ45 for 10/100 Base-TX Ethernet |
| Network Interface | Full Duplex/Half Duplex |
| | IEE 802.3 10BaseT Compliant |
| | IEE 802.3u 10BaseT Compliant |
| Protocol Support | TCP/IP, UDP/IP |
| Indicators | Power, "Good Ethernet Link", Ethernet Traffic, "Good SHDSL Link", "SHDSL connection initiation" |
| Indicator Type | LED |
| Dimensions (nominal) (HxWxD) | 35mm x 121mm x 119mm |
| Operating Temperature | 0 to 50 ^o C |
| Operation Voltage | 110V |
| Operating Current | Less than 1.0A at 110V |
| Weight | 0.3 kg |
| Relative Humidity | 5 to 95% relative humidity |
| Regulatory Compliance | EN 60950, EN 55024, FCC part 15, CSA 22.2 No. 60950 |
| Warranty | Three years |

10-3.44 ETHERNET HUB

Ethernet Hub shall conform to the details shown on plans and shall be in conformance with these special provisions. Ethernet Hub shall have the following features:

| ETHERNET HUB | |
|------------------------------|-----------------------------------------------------|
| FEATURE | PARAMETER/REMARKS |
| Unit Designation | Ethernet Hub |
| Number of Network Ports | 4 |
| Network Port type | 10/100BaseT |
| Number of Uplink Ports | 2 |
| Type of Uplink Port | 10/100BaseT |
| Network Port Connector | RJ45 |
| Network Interface | Auto sensing 10/100BaseT, Full Duplex/Half Duplex |
| | IEE 802.3 10BaseT Compliant |
| | IEE 802.3u 100BaseT Compliant |
| | IEE 802.3ab 1000BaseT Compliant |
| MAC Address | Configurable to at least 1000 MAC Addresses |
| Protocol Support | TCP/IP, UDP/IP, TELNET, SNMP v1/v2 |
| Indicators | Power, "Good Ethernet Link", Ethernet Traffic |
| Indicator Type | LED |
| Dimensions (nominal) (HxWxD) | (available cabinet space as shown on plans) |
| Operating Temperature | 0 to 60 ^o C |
| Operation Voltage | 110v |
| Operating Current | Less than 1.3A at 110v |
| Weight | 0.3 kg |
| Relative Humidity | 5 to 95% relative humidity |
| Regulatory Compliance | EN 60950, EN 55024, FCC part 15, CSA 22.2 No. 60950 |
| Warranty | Three Years |

10-3.45 MEDIA CONVERTER

Media converter shall conform to the details shown on the plans and shall be in conformance with these special provisions.

Media converter optical link range shall be suitable for the operational distances shown on the plan sheets.

Media converter may be the standalone type or may be the modular design type - card/slot, chassis mounted configuration. The chassis shall provide for the quantity of ports as shown on the plans.

Media converter shall be the single mode fiber interface type.

Media converter shall be a 10/100Base-TX to 100Base-FX single-mode converter with SC-Type connector and have the following features:

| MEDIA CONVERTER | |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FEATURE | PARAMETER/REMARKS |
| Ports | RJ-45 (10/100Base-TX) |
| | 100°Mbps duplex fiber port with SC-Type connector (single-mode) |
| 10/100 Base-TX port | Automatically senses 10°Mbps or 100°Mbps connection speed,
Auto-negotiates half- or full-duplex mode,
Auto-selects MDI/MDI-X media type |
| Fiber port | Half /full-duplex mode selector |
| Network media | 100Base-TX
and
100Base-FX: Single-Mode fiber optic cable
8/125°µm or 9/125°µm, full-duplex to 20°km |
| Serial Console Port | RS232 |
| Protocol | SNMP manageable through SNMP-enabled networking management system via console or add-on module |
| Data Transfer Rate | 100°Mbps (Half-Duplex), 200°Mbps (Full-Duplex) |
| Status LED indicators | power, copper link/activity, fiber optic link/activity, half/full duplex mode |
| Mounting | Standalone or Slot/Chassis Configuration as required |
| Power Supply | Supply voltage range 100 V to 135 V at 60°Hz.

Standalone units: Internal power supply (maximum power consumption 6°W) or external power supply (maximum power consumption 14°W)

Chassis units: only one power supply permitted |
| Power Adapter | Temperature:
Operating: 0 to 35°C |
| | Humidity:
Operating: up to 85% (non-condensing) |
| Standards Compliance | IEEE 802.3; FCC: Class A or Class B,
10/100Base-TX, 100Base-FX |
| Warranty | not less than 5 years for media and chassis (excludes power supplies, fans and lasers) |

10-3.46 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop wire shall be Type 2.

Loop detector lead-in cable shall be Type B.

Like-numbered detector loops, when shown on the plans, shall be connected to the same detector lead-in cable.

Slots shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

All loop detectors, excluding preformed loop detectors, on any leg of the intersection shall be of the same type. Preformed loop detectors shall conform to the requirements described in "Preformed Inductive Loops," elsewhere in these special provisions.

For Type E detector loops, sides of the slot shall be vertical and the minimum radius of the slot entering and leaving the circular part of the loop shall be 40 mm. Slot width shall be a maximum of 20 mm. .

The depth of loop sealant above the top of the uppermost loop wire in the sawed slots shall be 50 mm, minimum.

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 (State Specification 8040-06)," of the Standard Specifications.

The ends of loop detector lead-in cables terminating at a controller cabinet with double row barrier terminal blocks shall have crimped and soldered ring terminals, otherwise the ends shall have approximately 19 mm of insulation removed and the exposed wire soldered.

10-3.47 MICROWAVE VEHICLE DETECTION SYSTEM - SIDE FIRE

This work consists of furnishing and installing a microwave vehicle detection system (MVDS).

MATERIALS LIST AND DRAWINGS

A list of materials which the Contractor proposes to install for the MVDS together with the drawings and other data shall be submitted to the Engineer in conformance with Section 86-1.04, "Equipment List and Drawings," of the Standard Specifications. Additionally, the following shall be provided before the completion of the contract:

1. **Certificate of Compliance** - A Certificate of Compliance for MVDS shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.
2. **Site Analysis Report** - Prior to MVDS installation the Contractor shall review each detection site and provide a written analysis recommending the optimum sensor placement for meeting the performance requirements of this special provision. The analysis shall be reviewed and approved by the MVDS manufacturer.
3. **Lane Configuration** - The documentation shall include a diagram that illustrates how the microwave beam is covering the traffic lanes as well as the corresponding MVDS connector pins or wire terminals that correspond to the respective lanes. The lanes shall be identified by direction (NB, SB, EB, WB), and in order, with lane one being the lane nearest to the center of the roadway.
4. **Mounting and Wiring Information** - The Contractor shall provide to the Engineer for approval one set of detailed diagrams showing wiring and service connections for each MVDS. The approved diagrams shall be covered separately on each side with clear self-adhesive plastic and placed in a heavy-duty plastic envelope. The envelope shall be attached securely to the inside of the cabinet door or at a location designated by the Engineer.
5. **Communication Protocol** - The MVDS communication protocol shall be open and shall be freely available for use in the public domain. The Contractor shall provide documentation that defines the complete MVDS communication protocol (e.g. message structure organization, data packet length, as well as all information necessary to make use of such messages).
6. **Remote Programming** - The Contractor shall provide all information and software necessary for operating the system from a remote Windows 2000/NT or newer based Personal Computer (PC). This information and software shall include at minimum the capability to calibrate, tune, align, and program the MVDS and shall be provided on a Windows 2000/NT or newer compatible compact disc (CD). The information shall be formatted so that the files can be matched with the equipment being calibrated or aligned. This documentation shall contain files that allow for replacement equipment to be loaded with the same configuration.
7. **MVDS Accuracy Analysis** - The Contractor shall be responsible for conducting MVDS Performance Testing and shall submit to the Engineer an MVDS accuracy analysis that conforms to requirements of these special provisions within 15 days of MVDS testing. The original video recordings as well as digital versatile disc (DVD) or CD copies of the video images covering the analysis periods shall be included.

- 8. Acceptance Testing Documentation** - The Contractor shall provide a test plan, containing time and period of the testing, to be approved by the engineer. The test plan shall be organized so that the Engineer will be able to perform acceptance testing using the documentation without assistance from the Contractor. The Contractor shall collect and submit the data to be certified by the Engineer. If required by the Engineer, the data shall be collected in the presence of the Engineer.
- 9. Acceptance Testing Schedule** - The Contractor shall submit a testing schedule to the Engineer for approval 15 days prior to acceptance testing of the MVDS. If the testing period extends beyond the normal working shift or if the Contractor fails to provide the necessary material for the testing within one hour of the scheduled testing start time, the Engineer may cancel testing for the day.
- 10. Training** - The Contractor shall provide a copy of the training material to the Engineer for approval 30 days prior to the training. The content of the training shall include instruction on how to align, program, adjust, calibrate and maintain the MVDS.

FUNCTIONAL REQUIREMENTS

MVDSs shall simultaneously provide vehicle detection data in the form of vehicle presence, volumes, counts, speed, classification, and occupancy for a minimum of 8 lanes of traffic with the performance requirements of these special provisions. MVDSs shall provide a separate zone per lane and detect vehicles as close as 3 m and as far as 60 m from the MVDS sensor. MVDSs shall monitor traffic lanes in the presence of barrier railings, guardrails and other obstacles.

MVDSs shall meet the following detection performance criteria when installed a minimum of 3 m from the nearest lane and at a minimum height of 5 m above the roadway detection zone:

1. Average 5 minute volumes for all lanes combined with better than 95 percent accuracy compared to vehicles observed in video images for the same period, for any 15 minute period selected by the Engineer.
2. Average 30 second volumes in every lane with better than 90 percent accuracy compared to vehicles observed in video images for the same period, for any 5 minute period selected by the Engineer.
3. Average 30 second speed in any lane with better than 95 percent accuracy, for any 5 minute period selected by the Engineer.
4. Average 5 minute occupancy for any lane with better than 85 percent accuracy, for any 15 minute period selected by the Engineer.
5. Count accuracy, when compared to vehicles observed in video images for the same period, shall be not less than 90 percent for any lane and not less than 95 percent for all lanes combined.
6. Average 15 minute classification according to used defined criteria with better than 90 percent accuracy compared to vehicles observed in video images for the same period. Vehicle Classification (or Length Classification) shall be provided for categories (small car, average car, mid size car, long car, extra-long car) that are user definable as either by length parameters (minimum length to maximum length for the category) or by a multiple of length of the average car.
7. The Contractor shall provide the criteria for speed and volume acceptance test for approval by the Engineer. The Contractor shall also provide speed and volume data for verification by the Engineer.

MVDS shall consist of a sensor unit and include all required mounting hardware, power supplies, surge suppression, cables, connectors and wiring. The MVDS sensor shall include, as a minimum, a directional microwave transmitter, antenna, microwave receiver, a processor, memory and communication interface.

The MVDS shall be capable of supporting the data protocol as defined in the National Transportation Communication for ITS Protocol (NTCIP) Objects for Transportation Sensor Systems (TSS), Document Number 1209. The MVDS shall have an Ethernet communication port that supports the National Transportation Communication for ITS Protocol (NTCIP). The MVDS communication protocol shall be non-proprietary and openly specified and available for use in the public domain.

The manufacturer's data protocol may be accepted when the following conditions are met:

- A. The MVDS data protocol shall be open and shall be freely available for use in the public domain.
- B. The MVDS shall support the Wavetronix data protocol or the EIS RTMS (data) protocol version 6.8, or demonstrated equal.
- C. The Contractor shall submit a copy of the MVDS protocol to the Engineer for review. The Engineer will submit review results within 2 weeks after receipt of the protocol.

- D. Upon the Engineer's approval of the protocol, the Contractor shall submit a working unit for protocol verification purposes. The verification shall consist of connecting the unit to the State TMC computer using either the unit's serial or Ethernet port. The TMC computer will send and receive data to and from the MVDS unit. The Engineer will notify the Contractor upon successful communication between the MVDS unit and the TMC computer. The Engineer will complete MVDS unit testing within 2 weeks after receipt of the MVDS unit.

The MVDS shall be addressable and shall download count, speed, volume, classification and occupancy data when polled by the TMC computer. Speed shall be configurable in English or Metric units. The MVDS shall support unit set-up from a serial console port on the MVDS unit. The console port protocol shall support sensor unit set-up from a local Windows 2000/NT or newer compatible laptop or from a remote location with a desktop computer and standard phone modem. The console port shall have a DB-9 connector and be configured as Data Terminal Equipment. The MVDS shall have a 10/100 Base-T Ethernet port IEEE 802.3 compliant. The port shall be capable of transmitting MVDS traffic data to a central computer operating the manufacturer's MVDS software or to the TMC computer.

Each MVDS power connection shall have fast-blow AGC type fuse or a resettable circuit breaker such that the loss of power to any single MVDS due to over-current shall not limit the operation of the other connected MVDS. The fuses or breakers shall be easily accessible, and replaceable or resettable without requiring tools or removing cables, connectors, or other terminations. DB9 male connectors shall be provided for every connected MVDS unit for EIA-232 or EIA-485 communications with a local laptop computer for performing setup and diagnostics as well as remote communications. The connectors shall be labeled and provide internal routing of data between the DB9 connectors and the MVDS. The Contractor shall supply the cable and connectors for connecting all communication equipment as shown on the plans and specified elsewhere in these special provisions.

When MVDS sensor contact outputs will be connected to Model 170/2070 Controller to emulate inductive loops, then the following section will apply:

The MVDS sensors shall be connected to a microwave sensor interface card (MSIF) installed in the input file of a state furnished Model 170E or Model 2070 controller cabinet. Each detection zone shall provide an optically isolated relay contact pair that follows the presence of vehicles in every traffic lane and sends signals to the controller with the accuracy stated in these special provisions. The MSIF shall have indications for power, communication, as well as the real time operation of each detection contact output.

The Contractor shall install an MVDS termination assembly (MTA) as shown on the plans. The MTA shall be a single circuit board or a set of modular DIN rail mounted assemblies. The MTA shall provide screw lug cable terminations for all MVDS units with clearance for routing the cables and labels to identify the connected MVDS detectors. The MVDS unit shall be connected in the order shown on the plans or as directed by the engineer. Each lane detection zone shall have an LED that indicates vehicle presence with a minimum viewing angle of 50 degrees and visible from 1.5 m in daylight. Power shall be routed from the MTA to each MVDS unit. Each MVDS power connection shall have fast-blow AGC type fuse or a resettable circuit breaker such that the loss of power to any single MVDS due to over-current shall not limit the operation of the other connected MVDS. The fuses or breakers shall be easily accessible, and replaceable or resettable without requiring tools or removing cables, connectors, or other terminations. The MTA shall have DB9 male connectors for every connected MVDS unit for EIA-232 or EIA-485 communications with a local laptop computer for performing setup and diagnostics as well as remote communications. The Connectors shall be labeled and provide internal routing of data between the DB9 connectors and the MVDS terminal strips. The Contractor shall supply the cable and connectors for connecting the communication modem as shown on the plans and specified elsewhere in these special provisions.

MVDSs shall be user programmable in the field, via the MVDS unit console port, with a Windows 2000/NT or newer compatible laptop computer. The Contractor shall provide software, firmware and equipment to set-up, calibrate and operate the unit. MVDS software shall observe the vehicular traffic and automatically places detection lanes and set the sensor sensitivity. MVDSs shall be designed so that a trained State employee can configure and calibrate the MVDS in less than 15 minutes per lane once the MVDS sensor unit is installed.

TECHNICAL REQUIREMENTS

MVDSs shall be FCC certified under Part 15 for low-power, unlicensed, continuous radio transmitter operation. The MVDS shall comply with FCC regulations under all specified operating conditions and over the expected life of the MVDS.

MVDS sensor unit shall not exceed 250mm x 270mm x 355mm in size and shall not weigh more than 5 kg. The MVDS shall operate over a temperature range from -30 degrees C to +70 degrees C, with up to 95 percent relative humidity. The MVDS sensor enclosure shall be weatherproof with a NEMA 3R rating, and the sensor mounted and directed perpendicular to the flow of traffic lanes at the locations shown on the plans.

All electronic assemblies shall conform to the requirements detailed in Chapters 1 and 5 of the Transportation Electrical Equipment Specifications (TEES).

The MSIF shall be inserted into the controller input file slots using the edge connector to obtain limited 24 V(dc) power and to provide contact closure outputs. No rewiring to the Model 170E or Model 2070 cabinet shall be allowed. The MSIF shall conform to the requirements detailed in Chapter 1 as well as Sections 5.2.8, 5.2.8.1, 5.2.8.2, 5.4.1, 5.4.5, 5.4.5, and 5.4.6, 5.5.1, 5.5.5, and 5.5.6 of TEES.

Each MVDS sensor unit shall terminate all cables in a pole mounted NEMA 3R enclosure housing when shown on the plans. The enclosure shall house all communication equipment, MVDS sensor unit power supply or transformer, sensor communication interface and AC service connections. The sensor communication interface shall consist of the MVDS console port and Ethernet port. Equipment installed in the enclosure shall be mounted using standard hardware and as shown on the plans.

MVDS sensors shall be wired with a connectorized cable harness. Cables shall run continuously (without splices) between the sensor and controller cabinet and terminate in labeled terminal blocks identified with the purpose served. The connector shall be a standard Mil Type and rated plug. The cable shall have the number of conductors specified by the MVDS manufacturer to support the number of detection zones depicted on the plans plus spares for two future zones with an overall shield and copper drain wire. Conductors shall be stranded copper equal to or exceeding the minimum strands and wire dimensions specified by the MVDS manufacturer for the wiring distance involved and covered with a minimum 0.30 mm polyvinyl chloride (PVC) insulation, rated for 300 V at 105 degrees C. The outer jacket shall be chrome PVC with minimum thickness of 1.35 mm and the outside diameter of the cable shall not exceed 19.2 mm. A minimum of 2 m slack of MVDS cable shall be coiled at the bottom of the controller cabinet. Slack in other cabinets shall be as shown on the plans or as directed by the Engineer.

MVDS sensor unit power supplies or transformers shall be vertically mounted on a standard DIN rack rail using standard mounting hardware. The Contractor shall wire the MVDS power conductors to DIN rail mounted terminal blocks in the controller cabinet as directed by the Engineer. The serial data communication output conductors shall be terminated at TB-0, and continue for a minimum of 3 m to a DB9F connector for setup and diagnostic access. The contact pair output conductors shall be terminated at terminal block, TB-2. The ends of unused and spare conductors shall be coiled and taped to prevent accidental contact to other circuits. Conductors inside the cabinet shall be labeled for the functions as shown on the approved detailed diagrams.

The power supply or transformer shall meet or exceed the following minimum requirements:

| | Power Supply | Transformer |
|--------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Power Cord | Standard 120V(ac), 3 prong cord, at least 1 meter in length (may be added by Contractor) | Standard 120V(ac), 3 prong cord, at least 1 meter in length (may be added by Contractor) |
| Type | Switching mode type | Class 2 |
| Rated Power | Twice (2x) full system load | Twice (2x) full system load |
| Operating Temperature | From -35 °C to +74 °C | From -35 °C to +74 °C |
| Operating Humidity Range | From 5 percent to 95 | From 5 percent to 95 |
| Input Voltage | From 90 V to 135 VAC | From 90V to 135 VAC |
| Input Frequency | 60 Hz +/- 1 Hz | 60 Hz +/- 1 Hz |
| Inrush Current | Cold start, 25 A max. at 115 V | N/A |
| Output Voltage | As required by the MVDS | As required by the MVDS |
| Overload Protection | From 105 percent to 150 percent in output pulsing mode | Power limited at >150 percent |
| Over Voltage Protection | From 115 percent to 135 percent of rated output voltage | N/A |
| Setup, Rise, Hold Up | 800ms, 50ms, 15ms at 115VAC | N/A |
| Withstand Voltage | I/P-0/P:3kV, I/P-FG:1.5kV, for 60 sec. | I/P-0/P:3kV, I/P-FG:1.5kV, for 60 sec |
| Working Temperature | Not to exceed 70 °C@30% load | Not to exceed 70 °C@30% load |
| Safety Standards | UL 1012, TUV EN60950 | UL 1585 |
| EMC Standards | EN55022 Class B, EN61000-4-2, 3, 4, 5 and EN61000-3-2, 3 | N/A |

Field terminated circuits shall include transient protection that complies with IEEE Standard 587-1980 Category C.

The MVDS shall automatically restores normal operation following a power failure within 3 minutes and not require manual intervention. The MVDS shall maintain the configuration and calibration information in non-volatile memory and retain the information while powered off for at least 90 days.

The MVDS shall be configurable for 30 second to 24-hour polling cycles and store vehicle count, speed, classification, and occupancy data in 10 second to not less than 15 minute intervals.

The MVDS shall be tested and in standard production for a minimum of 3 months. The Contractor shall not install any MVDS that is older than 6 months from the scheduled start date of the MVDS installation as indicated by date codes or serial numbers of electronic circuit assemblies.

The MVDS system and all supporting equipment shall be designed to operate continuously in an outdoor traffic monitoring and control environment. The Contractor shall provide a manufacturer's warranty stating that the manufacturing quality and electronic components shall support a Mean Time Between Failures of 10 years in this environment.

CONSTRUCTION

The Contractor shall assure that the MVDS will not cause harmful interference to radio communication in the area of the installation as required by FCC Part 15 requirements. The MVDS units shall be installed such that each unit operates independently and that MVDS units not interfere with other MVDS units or other equipment in the vicinity.

The Contractor is responsible for site visits and analysis of each proposed pole location to assure that the detector placement will comply with the manufacturer's published installation instructions, and the performance required in these special provisions. The Contractor shall confirm detector placement with the manufacturer before performing work at the MVDS location. When the manufacturer's analysis requires a change in the proposed pole location, the Contractor shall arrange a meeting with the manufacturer and the Engineer to select a new pole location.

The Contractor shall not proceed with any MVDS installation without the Engineer's written approval of the pole location.

The Contractor shall be responsible for the compatibility of components and for making necessary calibration adjustment to deliver the performance required in these special provisions. The Contractor shall provide equipment required to setup, calibrate, verify performance and maintain the MVDS.

The Contractor shall provide programming software needed to support the MVDS. The software shall be installed in the appropriate equipment and used for the acceptance testing.

TESTING

Accuracy of the MVDS system shall be verified by comparing the MVDS vehicle counts to recorded video image counts for the same period. The video camera shall be located and oriented so that traffic is visible in all lanes. Video images shall be time stamped and analysis periods recorded to a DVD or CD media for viewing on a PC. The video field of view shall totally encompass the area in which vehicles are detected. The Contractor shall provide a means for synchronizing the test start and test ending times or provide software that displays time stamped MVDS data along with the video images of the moving vehicles. The Contractor shall provide the Engineer with the original recording medium and documentation that supports the accuracy analysis and make a copy of these materials for their own use.

The accuracy test shall take place during a complex traffic period as specified by the Engineer. The following video recording and analysis options that depend on the available traffic conditions are acceptable; however the heaviest expected traffic conditions should be used, if possible. The minimum recording period shall be 30 minutes when the recording includes congested traffic (vehicles traveling at less than 20 mph for five or more minutes in any lane). The minimum recording period shall be 45 minutes when the traffic flow exceeds 1500 vehicles per hour in any lane during the test period. The minimum recording period shall be 60 minutes when the flow is less than 1500 vehicles per hour in every lane. The analysis shall be based on a minimum of 100 detected vehicles in every lane and cover the same time period for all lanes. The time period within the selected video will be selected by the Engineer. The total vehicle count for every lane shall be used and include the first and last partial vehicles for each lane. Errors in the start and finish of the MVDS and manual counts are included in the performance criterion specified in these special provisions.

MVDS unit count shall be compared to vehicle counts under traffic conditions of the prior paragraph. Vehicles licensed for use on State roads shall be counted by the MVDS. The data accuracy shall be determined by the formula $100\{1-[(TC-MC)/TC]\}$ where TC= Traffic Count derived from the media recording, MC = MVDS reported count over the same period of time, and where the resulting fraction is expressed as an absolute value.

The accuracy of each MVDS unit shall be determined and documented so that each unit may be approved or rejected separately by the Engineer. Failure to submit the materials at the conclusion of testing invalidates the test. The recorded media serves as acceptance evidence and shall not be used for calibration. The calibration shall have been completed prior to testing and verification.

The Engineer will review the accuracy data findings and accept or reject the results within 15 days. Determination of vehicle anomalies or unusual occurrences will be decided by the Engineer. Data or counts that are not accepted by the Engineer shall be considered errors and count against the MVDS unit's calibration. If the Engineer finds that the MVDS does not meet performance requirements, the Contractor shall re-calibrate and re-test the unit and re-submit new test data within 10 days. Following three failed attempts, the Contractor shall replace the MVDS detector with a new unit.

In addition to the accuracy analysis performed by the Contractor, the Contractor shall provide equipment, software, documentation, support equipment, and any other materials, personnel and devices that may be required for acceptance testing by the Engineer. The Contractor shall notify the Engineer 15 days before the MVDS unit is ready for acceptance testing. Testing shall be scheduled to be accomplished before the end of the normal work shift.

TRAINING

The Contractor shall provide a minimum of 4 hours of training by a certified manufacturer's representative for up to 8 students selected by the Engineer. The content of the training shall include instruction on how to align, program, adjust, calibrate and maintain the MVDS. The Contractor shall provide materials and equipment for the training. The Contractor shall give the Engineer 15 days notice prior to the training. The time and location of the training shall be agreed upon by the Engineer and the Contractor. If no agreement can be reached, the Engineer shall determine the time and location.

10-3.48 EMERGENCY VEHICLE CABLE

Cable

Optical detector cable (EVC) shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600-V (ac) control cable, 75°C, Type B, and the following:

- A. The cable shall contain 3 conductors, each of which shall be No. 20 (7 x 28) stranded, tinned copper with low-density polyethylene insulation. Minimum average insulation thickness shall be 0.63-mm. Insulation of individual conductors shall be color coded: 1-yellow, 1-blue, 1-orange.
- B. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where film is used, a No. 20 (7 x 28) stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
- C. The jacket shall be black polyvinyl chloride with minimum ratings of 600 V (ac) and 80°C and a minimum average thickness of 1.1 mm. The jacket shall be marked as required by IPCEA/NEMA.
- D. The finished outside diameter of the cable shall not exceed 8.9 mm.
- E. The capacitance, as measured between any conductor and the other conductors and the shield, shall not exceed 157 pf per meter at 1000 Hz.
- F. The cable run between each detector and the controller cabinet shall be continuous without splices or shall be spliced only as directed by the detector manufacturer.

10-3.49 VIDEO IMAGE VEHICLE DETECTION SYSTEM

This work furnishes a Video Image Vehicle Detection System (VIVDS) for operating traffic signals on all approaches and all temporary ramp metering systems shown on the plans and includes an initial site analysis, set-up and system configuration, calibration of the system, performance accuracy verification and training.

MATERIALS LIST AND DRAWINGS

The Contractor shall submit a proposed list of materials before commencing work and drawings and other data before the completion of the contract:

- A. Certificate of Compliance** - Provide a Certificate of Compliance and report on the final installed configuration reviewed and approved by the manufacturer.
- B. Site Analysis Report** - Evaluate and provide a written analysis for each detection site recommending the optimum video sensor placement approved by the manufacturer.
- C. Lane Configuration** - Provide a diagram of each sensor assembly placement, mounting height, selected lens viewing angle and illustration of how the detection zone will map into reporting contact outputs as well as how output connector pins or wire terminals correspond to the lane assignments.
- D. Configuration Record** - Provide a Windows PC compatible Compact Disk (CD) that contains the final zone designs as well as calibration settings formatted to allow the same configuration to be re-installed and used in the event of disputed performance.
- E. Mounting and Wiring Information** - Provide one set of the approved diagrams detailing wiring and service connections, covered on each side with clear self-adhesive plastic and placed in a heavy-duty plastic envelope. Secure the envelope to the inside of the cabinet door or at a location designated by the Engineer.
- F. Communication Protocol** - Provide a document that completely defines the unit's communication protocol (message structure organization, data packet length as well as information necessary to make use of such messages) as well as all information needed for operating the system from a remote Windows based Personal Computer (PC).

- G. Programming Software** - Provide a PC compatible Compact Disk (CD) that contains set-up and calibration software which observes the vehicular traffic, allows placement of detection zones and adjustment of the detection sensitivity.
- H. Sensor Accuracy Analysis** - Submit to the Engineer a VIVDS accuracy analysis, including original video recordings as well as DVD or CD copies of the video images covering the analysis periods within fifteen days of accuracy testing.
- I. Acceptance Testing Schedule** - Submit an acceptance testing schedule to the Engineer for approval fifteen days prior to acceptance testing of the VIVDS. Acceptance testing shall be separate from the sensor accuracy testing noted in the previous paragraph.
- J. Acceptance Testing Documentation** - Provide documentation necessary to utilize the support equipment that is organized so that the Engineer will be able to perform acceptance testing using the documentation without assistance from the Contractor.
- K. Training** - Provide a copy of the training material to the Engineer for approval 30 days prior to the training.

FUNCTIONAL REQUIREMENTS

The VIVDS shall consist of enclosed and environmentally protected Video Image Sensor assemblies (VIS) and mounting hardware assemblies installed on poles or mast-arms as shown on the plans. The assemblies shall include necessary Video Detection Units (VDU), image processors, extension modules as well as power supplies, surge suppression, cables, connectors and wiring to a State-Furnished Type 332 traffic control cabinet.

The VIS image sensor and lens shall be housed in an environmentally sealed enclosure, watertight and dust tight to NEMA 4 standards. The enclosure shall include a thermostat controlled heater to prevent condensation and assure proper lens operation at low temperatures and an adjustable sun shield with provision to divert water from the sensor field of view. The assembly shall have waterproof connections for power, control and video signal cables and wiring.

The VIVDS shall include necessary hardware and software for designing the necessary detection pattern or zones at the intersection or approach. The detection zones shall be created with a graphic user interface designed to allow a trained VIVDS system operator to configure and calibrate a lane in less than 15 minutes. The system shall support normal operation of existing detection zones while a zone is being added or modified. The zone shall flash or change color on a viewing monitor whenever a vehicle is detected.

The VIVDS shall include software and firmware that detects vehicle presence and count, the means to set-up detection zones, test the VIVDS performance as well as view the video scenes and operate the system from a remote location.

The system shall allow the user to define detection zones or elements and to set detection outputs for presence or pulse operation. The number of optically isolated detection outputs shall be equal to the detection zones shown on the plans plus one spare output for every approach.

The VIVDS shall support a minimum of two separate detection pattern or zone arrangements that can be automatically enacted by timed schedule from the traffic controller or by a remote operator over a network connection. The system shall detect low-visibility conditions including fog and inclement weather and respond by selecting a predefined detection pattern and, when necessary, placing all defined detection zones into a constant call mode. VIVDS outputs shall assume a fail-safe "on" or "call" for presence detection in the event of loss of video signal or power failure and recover from a power failure by restoring normal operation within three minutes without manual intervention. The system shall maintain the configuration and calibration information in memory while powered off for at least 90 days.

The VIVDS shall detect the presence of vehicles at the limit line and loop positions shown on the plans and provide corresponding VIVDS contact outputs to the Model 170E or Model 2070 input files. The system shall detect vehicle presence at the limit line with 98% accuracy for each approach and over each one hour test period. The system shall not miss the detection of more than 3% of the vehicles present and not indicate more than 5% false vehicle readings for any traffic movement. Detected vehicle presence shall be indicated in 0.25 seconds or less of occurrence and the VIVDS shall hold presence for vehicles stopped in a detection zone for up to 10 minutes.

The VIVDS shall count vehicles with a better than 95 percent accuracy for each approach over each one hour test period and when compared to video recorded vehicle observations. The VIVDS shall be able to locally store for remote retrieval per lane vehicle count data in 10, 20, 30, and 60 minute intervals for a minimum period of one week (168 hours).

The VDU front panel shall have indications for power, communication, presence of video input for each video sensor as well as the real time detector output operation. A test switch shall have positions that allow the user to place either a constant or momentary call for each approach. The indications shall be visible in daylight from 1.5°m away.

A pull down flat panel video display (with a minimum 200mm screen and as recommended by the VIVDS manufacturer as suitable for the application intended) shall be furnished and installed in the 332 cabinet for viewing video detector images and for diagnostic testing. Each VIVDS system shall have video connections that support the NTSC video output format and means shall be included that allow the user to switch to any video signal at an intersection. The system is to allow independent viewing of any scene while video recording any other scene without interfering with the operation of the system outputs.

The VIVDS shall have a serial communication port that supports sensor unit setup, diagnostics and operation from a local Windows PC compatible laptop. The VIVDS shall have an ethernet communication card and include necessary software to support remote real-time viewing and operation over a Wide Area Network (WAN) connection.

TECHNICAL REQUIREMENTS

System elements shall be designed to operate continuously in an outdoor traffic monitoring and control environment, 24 hours a day. Manufacturing quality and electronic components shall support a minimum mean time between failure (MTBF) of ten (10) years.

The video image sensor assembly (VIS) shall include the video sensor, a zoom lens and weathertight enclosure. The video sensor shall use a Charged Coupled Device (CCD) element and support NTSC and RS170 video output formats with resolution of not less than 360 horizontal lines. The video sensor shall include an Auto-Gain Control circuit (AGC), have a minimum sensitivity to scene luminance from 0.1 lux to 10,000 lux and produce a usable video image of vehicles, under all roadway lighting conditions and regardless of the time of day. The sensor shall have a motorized lens with variable focus and zoom control with an aperture of f/1.4 or better. The focal length shall allow +/- 50% adjustment of the detection scene.

The enclosed video image sensor assembly (VIS) shall operate from -34°C to +74°C and 0 percent to 95 percent relative humidity, weigh less than 3 kg and present less than 930 sq cm of effective wind surface to any direction.

Sensor unit mounting hardware shall be stainless steel or be treated to withstand 250 hours of salt fog exposure under ASTM Designation: B117 conditions without any visible corrosive damage.

The VDU including image processors, extension modules and video output assemblies shall insert into the controller input file slots using the edge connector to obtain limited 24VDC power and to provide contact closure outputs. Cabling to a “D” connector on the front of the VDU is acceptable. No rewiring to the standards 332 cabinet shall be allowed. The controller cabinet resident modules shall conform to the requirements detailed in Chapter 1 as well as Sections 5.2.8, 5.2.8.1, 5.2.8.2, 5.4.1, 5.4.5, 5.4.5, and 5.4.6, 5.5.1, 5.5.5, and 5.5.6 of the Transportation Electrical Equipment Specifications (TEES)

The VIVDS shall operate from 95 to 135 VAC service per NEMA TS-1. The VIS sensor assembly, excluding the heater circuit, shall draw less than 10 watts of power. The power supply or transformer for the VIVDS shall meet the following minimum requirements:

| Item | Power Supply | Transformer |
|--------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Power Cord | Standard 120V(ac), 3 prong cord, at least 1 meter in length (may be added by Contractor) | Standard 120V(ac), 3 prong cord, at least 1 meter in length (may be added by Contractor) |
| Type | Switching mode type | Class 2 |
| Rated Power | Two time (2x) full system load | Two time (2x) full system load |
| Operating Temperature | -35°C to 74°C | -35°C to 74°C |
| Operating Humidity Range | From 5 to 95 percent | From 5 to 95 percent |
| Input Voltage | From 90°V(ac) to 135°V(ac) | From 90°V(ac) to 135°V(ac) |
| Input Frequency | 60 Hz +/- 3 Hz | 60 Hz +/- 3 Hz |
| Inrush Current | Cold start, 25 A max. at 115 V | N/A |
| Output Voltage | As required by the VIVDS | As required by the VIVDS |
| Overload Protection | From 105 percent to 150 percent in output pulsing mode | Power limited at >150% |
| Over Voltage Protection | From 115 percent to 135 percent of rated output voltage | N/A |
| Setup, Rise, Hold Up | 800 ms, 50 ms, 15 ms at 115°V(ac) | N/A |
| Withstand Voltage | I/P-0/P:3 kV, I/P-FG:1.5 kV, for 60 seconds | I/P-0/P:3 kV, I/P-FG:1.5 kV, for 60 seconds |
| Working Temperature | Not to exceed 70°C@30% load | Not to exceed 70°C@30% load |
| Safety Standards | UL 1012, TUV EN60950 | UL 1585 |
| EMC Standards | EN55022 Class B, EN61000-4-2, 3, 4, 5 | N/A |

Transient protection that complies with IEEE Standard 587-1980 Category C shall be included for all field terminated circuits. Video connections shall be isolated from ground.

Equipment, parts and support equipment required by the Engineer for acceptance testing shall be new and conform with the manufacturer’s recommendations. The date of manufacture, as shown by date codes or serial numbers of electronic circuit assemblies, shall not be older than six months from the scheduled start date of this installation. No substitutions of materials shall be allowed that deviate from the list of materials approved by the Engineer.

CONSTRUCTION AND TESTING

The Contractor may be required to perform a field demonstration of the VIVDS at a particular site selected to approximate the conditions under which the system will need to operate for the project. During the demonstration the unit must prove it can meet the requirements of this SSP. The Engineer has the right to reject the material if the demonstration fails to show the device compliant.

The Contractor shall perform the following:

1. Provide personnel skilled in the physical installation of video detection including selection of correct camera locations, the right cabling and connector connection as well as zone design, VIVDS set-up and calibration. Conduct a site analysis of each installation and provide a written recommendation for optimum camera placement prior to installation.
2. Provide the number of video image sensors (VIS) to cover vehicle detection for every approach shown on the plans. Install the corresponding Video Detection Units (VDU) in a State Furnished Model 170E controller assembly. Install the VIS power supply or transformer on a standard DIN rail using standard mounting hardware and wire power conductors to DIN rail mounted terminal blocks in the controller cabinet as directed by the Engineer.
3. Wire each VIS sensor assembly to the controller cabinet with a connectorized wiring harness that includes all power and control wiring as well as coaxial video cable and attach with standard Mil Type and rated plugs. The cable type and wire characteristics (rated for 600 V and 75°C, minimum) shall meet the manufacturer's recommendations for the respective VIS to cabinet distances of the project. Run wiring and cables continuously (without splices) between the VIS sensor and controller cabinet. Coil a minimum of two meter slack in the bottom of the controller cabinet or as directed by the Engineer. Terminate the serial data communication output conductors at TB-0, and continue for a minimum of three meters to a DB9F connector for setup and diagnostic access. Coil and tape the ends of unused and spare conductors to prevent accidental contact to other circuits. Label conductors inside the cabinet for the functions as depicted in the approved detailed diagrams.
4. Adjust the lens to view 110% of the largest detection area dimension. Create the detection zones or elements to meet the performance requirements of this SSP. Logically combine zones or elements into reporting contact outputs that are equivalent to the detection loops shown on the plans with the detection accuracy required by this specification.
5. Verify the performance of each unit individually and submit the recorded medium and other materials to the Engineer at the conclusion of the performance test. The accuracy of each unit shall be determined and documented so that each unit may be approved or rejected separately by the Engineer. Failure to submit the materials at the conclusion of testing invalidates the test. The recorded media serves as acceptance evidence and shall not be used for calibration. The calibration shall have been completed prior to testing and verification.
6. Verify the limit line presence detection accuracy by comparing the VIVDS performance to observations of recorded video images for the same period. Record time stamped video images with superimposed vehicle presence detection and count indication and transfer the images for the selected analysis periods to a DVD or CD media for viewing on a PC. Video record each approach for two sixty minute periods that span dusk and dawn, separately covering the day to night and night to day transitions and including no less than 250 vehicles for each approach and each test period. Provide all software needed for image conversion and analysis. The Contractor shall make a copy of the recording medium for the Contractor's use.

Presence detection accuracy shall be based on the observed operation of the detection contact outputs where such outputs can be logical combinations of several detection zones or elements. Detection errors shall be defined as follows:

| # | Error | Description |
|---|----------------------|----------------------------------------------------------------------------------------------------------|
| 1 | False Detection | When an output reports a vehicle presence when no vehicle is observed |
| 2 | Failure to Detect | When a vehicle is present in the zone or at the limit line and the output fails to report a presence |
| 3 | Drop After Detection | When a vehicle is initially detected but the output report is dropped while the vehicle remains present. |

The presence detection accuracy for an approach shall be determined by the formula $100(1 - \{NE/TC\})$ where TC = the Traffic Count observed from the media recording for the period, and NE = Net Errors observed over the same period. Net errors are obtained by adding the number of observed false calls (error 1 above) while subtracting the number of missed vehicle events and dropped vehicle presence events (errors 2 and 3 above) for each period. The $\{NE/TC\}$ shall be an absolute value. The VIVDS shall not indicate more than 5% in false vehicle readings(error 1 above), not miss the detecting of more than 3% of the vehicles present (errors 2 and 3 above) and the resulting presence detection accuracy shall be at least 98 percent.

The VIVDS vehicle count accuracy shall be determined by the formula $100(1-DC/TC)$ where DC = the Detector Vehicle Count and TC = the Traffic Count observed from the media recording for the period. Vehicle count accuracy shall be better than 95 percent for each test period.

The Engineer will review the data findings and accept or reject the results within 7 days. Determination of any vehicle anomalies or unusual occurrences will be decided by the Engineer. Data or counts that are not agreed upon by the Engineer shall be considered errors and count against the unit's calibration. If the Engineer determines that the VIVDS does not meet the performance requirements, the Contractor will have seven days to re-calibrate and re-test the unit and re-submit new test data. Following three failed attempts, the Contractor shall replace the VIVDS system with a new unit.

The Contractor shall notify the Engineer 15 working days before the unit is ready for acceptance testing. Acceptance testing shall be scheduled to be accomplished before the end of the normal work shift. The Contractor shall demonstrate the operation of all VIS cameras and VDU units satisfy the functional requirements of these special provisions.

The Contractor shall also: 1) Provide all equipment, documentation, materials and personnel required for acceptance testing of the system, 2) Provide the Engineer with a list of any special tools needed for the acceptance testing, operation and maintenance of the system, and 3) Provide programming and software required to support the VIVDS system, installed in the appropriate equipment at the time of acceptance testing, and used for the acceptance test.

Repair, replacement, and retesting of video image vehicle detection system components due to failure or rejection shall be at the Contractor's expense.

WARRANTY

The Contractor shall provide the manufacturer's written warranty against defects in materials and workmanship for video image sensor assemblies and video detection units for a period of 24 months after installation of the video image sensor assemblies and video detection units. After final acceptance of the video image vehicle detection system, replacement video image sensor assemblies and video detection units shall be provided within 10 days after receipt of failed units at no cost to the State, except the cost of shipping the failed video image sensor assemblies and video detection units. All warranty documentation shall be given to the Engineer prior to installation. Replacement video image sensor assemblies and video detection units shall be delivered to the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

10-3.50 SIGN LIGHTING FIXTURES-INDUCTION

Induction sign lighting fixtures shall conform to the provisions for mercury sign lighting fixtures in Section 86-6.05, "Sign Lighting Fixtures-Mercury," of the Standard Specifications and these special provisions.

Each fixture shall consist of a housing with door, a reflector, refractor or a lens, a lamp, a power coupler, a high frequency generator and a fuse block. Fixtures shall have a minimum average rating of 60 000 hours. Fixtures shall be for a wattage of 87 W, 120/240 V (ac). The power factor of the fixtures shall be greater than 90 percent and the total harmonic distortion shall be less than 10 percent. Fixtures shall be Underwriter's Laboratories (UL) approved for wet locations and be Federal Communications Commission (FCC) Class A listed.

The mass of the fixture shall not exceed 20 kg. The manufacturer's brand name, trademark, model number, serial number and date of manufacture shall be located on the packaged assembly and permanently marked on the outside and inside of the housing.

MATERIALS

Mounting Assembly

The mounting assembly may be either cast aluminum, hot-dip galvanized steel plate or steel plate that has been galvanized and finished with a polymeric coating system or the same finish that is used for the housing.

Housing

Housings shall have a door designed to hold a refractor or lens. Housing doors shall be designed to be opened without the use of special tools. Housings and doors shall have a powder coat or polyester paint finish of a gray color resembling unfinished fabricated aluminum.

The maximum height of the fixture shall not be greater than 325 mm above the top of the mounting channels.

Reflector

Reflectors may be designed to be removed as a unit that includes the lamp and power coupler.

Refractor

Refractors or lenses shall have smooth exteriors. Lenses shall be flat or convex. Convex lenses shall be made from heat resistant, high-impact resistant, tempered glass.

Convex lenses shall be designed or shielded so that no fixture luminance is visible when the fixture is approached directly from the rear and the viewing level is the bottom of the fixture. When a shield is used it shall be an integral part of the door casting.

Lamp

Each fixture shall be furnished with a 85-W induction lamp. Interior lamp walls shall be fluorescent phosphor coated. Lamp light output shall be at least 70 percent at 60 000 hours. Lamps shall have a minimum color-rendering index of 80. Lamps shall be rated at a color temperature of 4 000K. Lamps shall be removable without the use of tools.

Power Coupler

Power couplers shall consist of a construction base with antenna, heat sink and electrical connection cable. The power coupler shall be designed so that it can be removed with common hand tools.

High Frequency Generator

High frequency generators shall start and operate lamps at an ambient temperature of -25°C or greater for the rated life of the lamp.

Generator output frequency shall be 2.65 MHz +/- 10 percent. The generator radio frequency interference shall meet the requirements of the Federal Communications Commission Title 47, Part 18, regulations concerning harmful interference.

High frequency generators shall operate continuously at ambient air temperatures from -25°C to 25°C without reduction in generator life. High frequency generators shall have a design life of at least 100 000 hours at 55°C.

High frequency generators shall be capable of being replaced with common hand tools. Conductor terminals shall be identified as to the component terminal to which they connect.

High frequency generators shall be mounted to use the fixture upon which they are mounted as a heat sink.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and a copy of the high frequency generator test methods and results shall be submitted by the manufacturer with each lot of fixtures. The certificate shall state that the high frequency generators meet the requirements of this section and the generator specifications of the lamp manufacturer.

Retrofit Kit

10-3.51 PHOTOELECTRIC CONTROLS

Contactors shall be the mechanical armature type.

10-3.52 MODEL 510 CHANGEABLE MESSAGE SIGN SYSTEM

Model 510 changeable message sign (CMS) systems consist of a Model 510 changeable message sign, a Model 170 controller assembly in a completely wired Type 1 or similar cabinet and the required wiring and auxiliary equipment required to control the CMS shown on the plans and in conformance with these special provisions.

The Model 510 changeable message signs, wiring harness and Model 170 controller assembly including controller unit and completely wired cabinet, but without anchor bolts, will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Model 510 changeable message sign system components will conform to the requirements in "Specifications for Changeable Message Sign System," issued by the State of California, Department of Transportation, and to the addendums thereto current at the time of project advertising. Model 170 controller assemblies will conform to the requirements in "Traffic Signal Control Equipment Specifications," issued by the State of California, Department of Transportation, and to the addendums thereto current at the time of project advertising.

Attention is directed to "Sign Structures" of these special provisions.

The sign assembly shall be installed on the sign structure. The controller cabinet foundation shall be constructed as shown on the plans for Model 334 cabinets (including furnishing and installing anchor bolts), the controller cabinet shall be installed on the foundation, and the field wiring connections shall be made to the terminal blocks in the sign assembly and in the controller cabinet.

Field conductors No. 12 and smaller shall terminate with spade terminals. Field conductors No. 10 and larger shall terminate in spade or ring terminals.

A listing of field conductor terminations, in each State-furnished changeable message sign and controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

The location of the foundation for each controller cabinet will be determined by the Engineer.

State forces will maintain the sign assemblies. The Contractor's responsibility shall be limited to conformance with the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

10-3.53 PAYMENT

The contract lump sum price or prices paid for signal and lighting shall include highway lighting at intersections in connection with signals only.

The contract lump sum price or prices paid for ramp metering shall include highway lighting at ramps in connection with ramp metering only.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for lighting and sign illumination.

If any of the fabrication sites for the materials listed are located more than 480 air line kilometers 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 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$1500:

1. Variable message signs
2. Service equipment enclosures

Full compensation for furnishing all labor, materials (excluding the State-furnished BBS), tools, equipment, and incidentals and for doing all the work involved in installing the battery backup system, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer shall be considered as included in the lump sum price paid for the item of work involved and no separate compensation will be made therefor.

The contract lump sum price paid for fiber optic communication system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fiber optic communication system complete in place, including furnishing and installing the Multiduct Conduit System (MDCS), fiber optic vaults, pull boxes and trench delineators as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for Video Image video Detection System shall be considered as included in the contract lump sum price paid for Signal and Lighting and Temporary ramp metering system and no separate payment will be made therefor.

The contract lump price paid for temporary communication system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in temporary communication system, 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 microwave vehicle detection system shall be considered as included in the contract lump sum price paid for traffic monitoring stations and ramp metering system and no additional compensation will be made therefor.

The contract lump price paid for temporary traffic monitoring station shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in temporary traffic monitoring station, 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 price paid for temporary ramp metering system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in temporary ramp metering, 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 price paid for temporary lighting shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in temporary lighting, 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 price paid for HOV reversible lane system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in HOV reversible lane system, 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 price paid for remove and maintain toll booth services shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in remove and maintain toll booth services, 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 changeable message sign system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in changeable message sign system, 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 electric service (irrigation) shall be considered as included in the contract lump sum price paid for lighting and sign illumination and no separate payment will be made therefor.